$$F = ma \qquad F_c = m a_c$$

$$a = \frac{F}{m} \qquad a_c = \frac{F_c}{m} = \frac{v^2}{r}$$

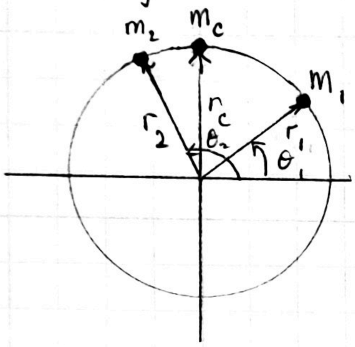
$$a = a_c \implies \frac{F}{m} = \frac{v^2}{r}$$

$$F = \frac{mv^2}{r} \; ; \; v = r\omega$$

$$F_c = \frac{m(r\omega)^2}{r} = m r \omega^2$$

(static)

* For balancing, ω^2 can be thrown out (Design of Machinery, Norton. p631)



$$m_c r_c = m_1 r_1 + m_2 r_2$$

$$x: m_c r_{c_x} = m_1 r_{1_x} + m_2 r_{2_x}$$

$$y: m_c r_{c_y} = m_1 r_{1_y} + m_2 r_{2_y}$$

From test results:

$m_c = 10\text{lb}$; mass

$r_c = 9\text{in}$; radius

$\theta_c = 0°$

Assume:

$r_1 = r_2$

$$x: \quad (10 \times 9)\cos(0) = m_1 r_1 \cos(\theta_1) + m_2 r_2 \cos(\theta_2)$$

$$y: \quad (10 \times 9)\sin(0) = m_1 r_1 \sin(\theta_1) + m_2 r_2 \sin(\theta_2)$$

$$x: 90 = m_1 r_1 \cos(\theta_1) + m_2 r_2 \cos(\theta_2)$$

$$y: 0 = m_1 r_1 \sin(\theta_1) + m_2 r_2 \sin(\theta_2)$$

$$\theta_c = \arctan\left(\frac{m_c r_{c_y}}{m_c r_{c_x}}\right)$$

$$r_c = \sqrt{r_{c_x}^2 + r_{c_y}^2}$$

$$m_c r_c = m_c \sqrt{r_{c_x}^2 + r_{c_y}^2}$$

$$= \sqrt{m_c^2 r_{c_x}^2 + m_c^2 r_{c_y}^2} = \sqrt{(m_c r_{c_x})^2 + (m_c r_{c_y})^2}$$