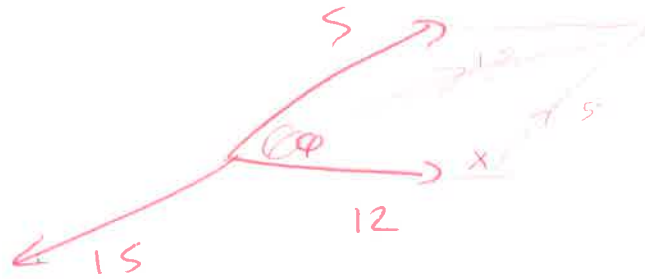


2013

7.a

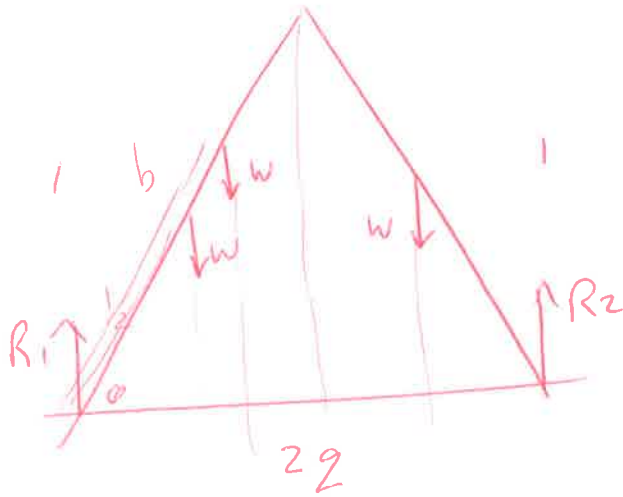


$$15^2 = 12^2 + s^2 - 2(12)(s)\cos x$$

$$x = 117.82^\circ$$

$$\phi = 62.18^\circ$$

7.b



$$\uparrow \downarrow \quad \boxed{3w = R_1 + R_2} \quad (1)$$

GA:

$$w \left(\frac{1}{2} \cos \phi \right) + w (b \cos \phi) + w \left(\frac{3}{2} \cos \phi \right) = R_2 (2 \cos \phi)$$

$$\frac{w}{2} + wb + \frac{w3}{2} = R_2 2$$

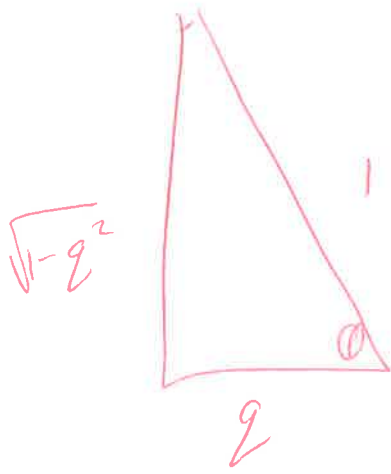
$$w + 2wb + 3w = 4R_2$$

$$4w + 2wb = 4R_2$$

$$\boxed{2w + wb = 2R_2} \quad (2)$$



$$\begin{aligned} \uparrow \text{top} : w \left(\frac{1}{2} \cos \phi \right) + T (\sin \phi) \\ = R_2 (\cos \phi) \end{aligned}$$



$$\frac{W}{2} \cdot 2 + T \cdot \sqrt{1-g^2} = R_2 g \quad (3)$$

want T , need R_2

$$(1) : R_2 = 3W - R_1$$

$$(2) R_2 = W + \frac{Wb}{2}$$

$$(2) R_2 = W + \frac{Wb}{2}$$

$$R_2 = R_2$$

into (3)

$$\frac{W}{2} g + T \sqrt{1-g^2} = \left(W + \frac{Wb}{2} \right) g$$

$$2T \sqrt{1-g^2} = -Wg + 2Wg + Wbg$$

$$T = \frac{Wg + Wbg}{2 \sqrt{1-g^2}}$$

$$T = \frac{Wg(1+b)}{2 \sqrt{1-g^2}}$$