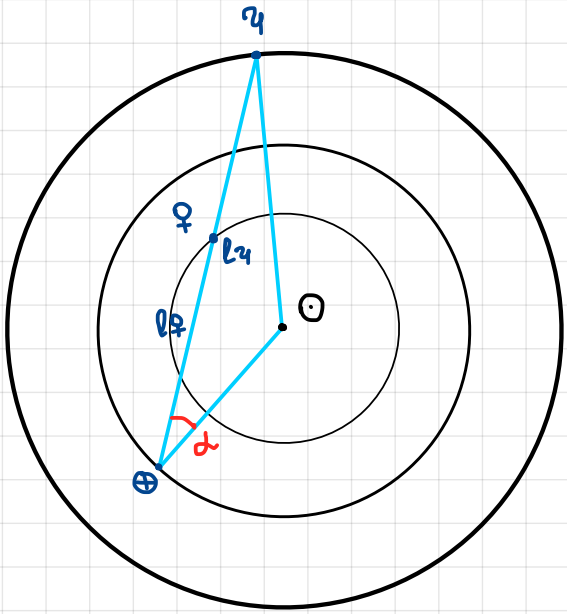
Дано: $\sigma_♀ = \sigma_♃$; $R_♀ = 6052$ км; $R_♃ = 71492$ км; $a_♃ = 5{,}2$ а.е.; $a_♀ = 0{,}72$ а.е.; $a_⊕ = 1$ а.е.

Найти: α - ?

Решение:



$$\left.\begin{aligned}\sigma_♀ &= \frac{R_♀}{l_♀}\\ \sigma_♃ &= \frac{R_♃}{l_♃}\end{aligned}\right\} \Rightarrow \frac{R_♀}{l_♀} = \frac{R_♃}{l_♃} \Rightarrow l_♃ = \frac{R_♃ l_♀}{R_♀} \approx 11{,}8\, l_♀$$

По теореме косинусов:

$$\left.\begin{aligned}a_♀^2 &= a_⊕^2 + l_♀^2 - 2\cos\alpha\, a_⊕ l_♀\\ a_♃^2 &= a_⊕^2 + l_♃^2 - 2\cos\alpha\, a_⊕ l_♃\end{aligned}\right\} \Rightarrow \begin{aligned}a_♃^2 &= a_⊕^2 + 139{,}24\, l_♀^2 - 2\cos\alpha\, a_⊕ \cdot 11{,}8\, l_♀\\ 2\cos\alpha\, a_⊕ l_♀ &= a_⊕^2 + l_♀^2 - a_♀^2\end{aligned}$$

$$a_♃^2 = a_⊕^2 + 139{,}24\, l_♀^2 - 11{,}8\, a_⊕^2 - 11{,}8\, l_♀^2 + 11{,}8\, a_♀^2$$

$$a_♃^2 - 11{,}8\, a_♀^2 + 10{,}8\, a_⊕^2 = 127{,}44\, l_♀^2$$

$$l_♀ = \sqrt{\frac{a_♃^2 - 11{,}8\, a_♀^2 + 10{,}8\, a_⊕^2}{127{,}44}} \approx 0{,}499 \text{ а.е.}$$

$$\alpha = \arccos\left(\frac{a_⊕^2 + l_♀^2 - a_♀^2}{2 a_⊕ l_♀}\right) \approx 43{,}3^\circ$$

Ответ: $43{,}3^\circ$