

41. The period T and orbit radius r are related by the law of periods: $T^2 = (4\pi^2/GM)r^3$, where M is the mass of Mars. The period is 7 h 39 min, which is 2.754×10^4 s. We solve for M :

$$\begin{aligned} M &= \frac{4\pi^2 r^3}{GT^2} \\ &= \frac{4\pi^2 (9.4 \times 10^6 \text{ m})^3}{(6.67 \times 10^{-11} \text{ m}^3/\text{s}^2 \cdot \text{kg})(2.754 \times 10^4 \text{ s})^2} = 6.5 \times 10^{23} \text{ kg} . \end{aligned}$$