Problem:

The mean distance of Mars from the Earth is 0.5 A.U. and its orbital period is 687 days.

Calculate the orbital period of Jupiter given that its mean distance from the Earth is

4 A.U.

Solution:

Due to the Third Kepler's Law, the orbital period of a planet is directly proportional to the cube of the semi-major axis of its orbit.

The axis of Mars is 1.5 A. U. (0.5 A. U. form the Earth plus 1 A. U. between the Earth and the Sun) while the axis of Jupiter is 5 A. U. (4 A. U. form the Earth plus 1 A. U. between the Earth and the Sun).

Then we can set up a proportion using the Third Kepler's Law:

Mars	1.5^3	687
Jupiter	5^3	x

Then

$$x = \frac{687 \cdot 5^3}{1.5^3} \approx 25444$$

Thus, the orbital period of Jupiter should be 25 444 days. (This number is far away from the exact since only the mean distances were given, while the Third Law requires semi-major axes).