## Answer on Question 73123, Physics, Astronomy, Astrophysics

## Question:

The planet Mars takes 1.88 years to complete on revolution around the Sun. The mean distance of the Earth from the Sun is $1.5 \cdot 10^{8} \mathrm{~km}$. Calculate that distance of planet of Mars.

## Solution:

We can find the mean distance of the Mars from the Sun from the third Kepler's law of planetary motion. It states that the square of the orbital period of a planet is proportional to the cube of the semi-major axis (mean distance) of its orbit:

$$
\frac{P_{M}^{2}}{a_{M}^{3}}=\frac{P_{E}^{2}}{a_{E}^{3}}
$$

here, $P_{M}$ is the orbital period of the Mars, $P_{E}$ is the orbital period of the Earth, $a_{M}$ is the mean distance of the Mars from the Sun, $a_{E}$ is the mean distance of the Earth from the Sun.

Then, from this formula we can find the mean distance of the Mars from the Sun:

$$
a_{M}^{3}=a_{E}^{3} \frac{P_{M}^{2}}{P_{E}^{2}}
$$

$$
a_{M}=\sqrt[3]{a_{E}^{3} \frac{P_{M}^{2}}{P_{E}^{2}}}=\sqrt[3]{\left(1.5 \cdot 10^{8} \mathrm{~km}\right)^{3} \cdot \frac{(1.88 \text { year })^{2}}{(1.0 \text { year })^{2}}}=2.28 \cdot 10^{8} \mathrm{~km} .
$$

## Answer:

$a_{M}=2.28 \cdot 10^{8} \mathrm{~km}$.

