Orchard Lyceum Final Project.

Introduction:

The human population has reached an enormous size of 10 billion. Fortunately the year is 2079 and space teleportation via worm holes is now possible.

You have been tasked with overseeing the exploration of habitable planet, planet X. The space probe LY-023 has been sent down to gather vital information.

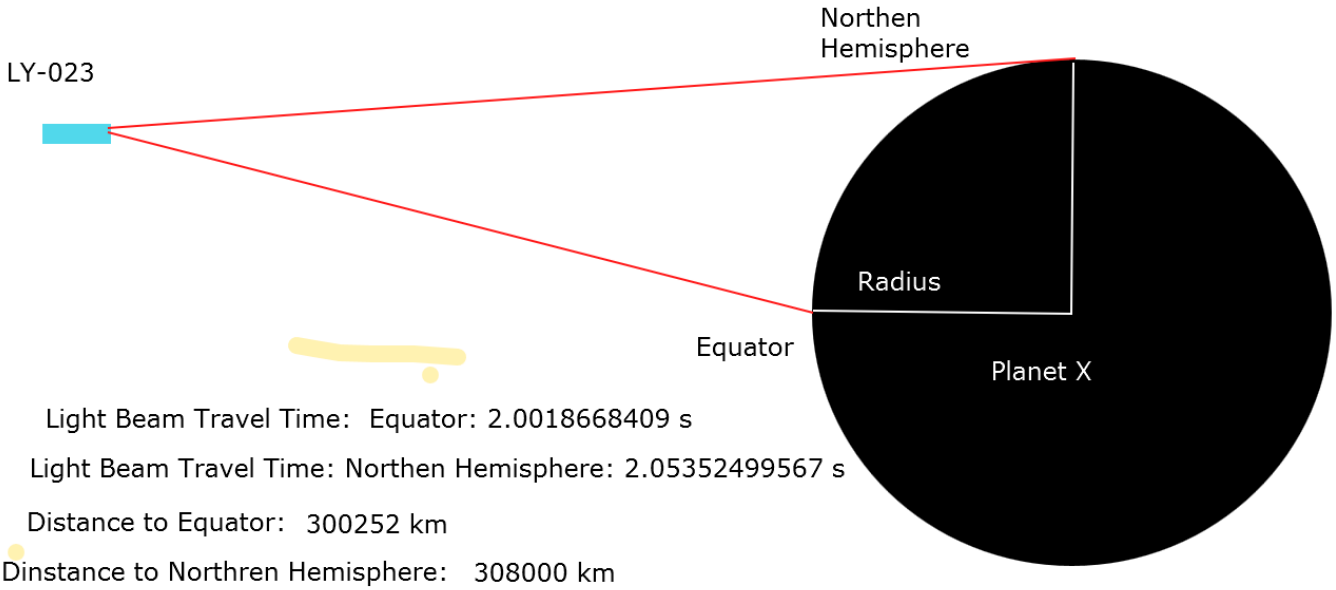
1.Upon approach LY-023 scans the planet from a distance via electromagnet waves two waves are sent towards the planet at the exact same time. One electromagnetic wave is sent to the very tip of the northern hemisphere of the planet and one is sent at the equator.

The speed of all electromagnetic waves are 299,972 km/sec.

It takes the wave that bounces off the equator 2.00018668409 seconds to return to LY-023. It takes the wave that bounces off the northern hemisphere 2.05352499567 seconds to return to LY-023.

What is the radius of planet X and how far away is LY-023 orbiting the planet.

Assume LY-023 resides in a transverse location that is directly between the equator and northern hemisphere.



Light Beam Travel Time: Equator: 2.0018668409 s

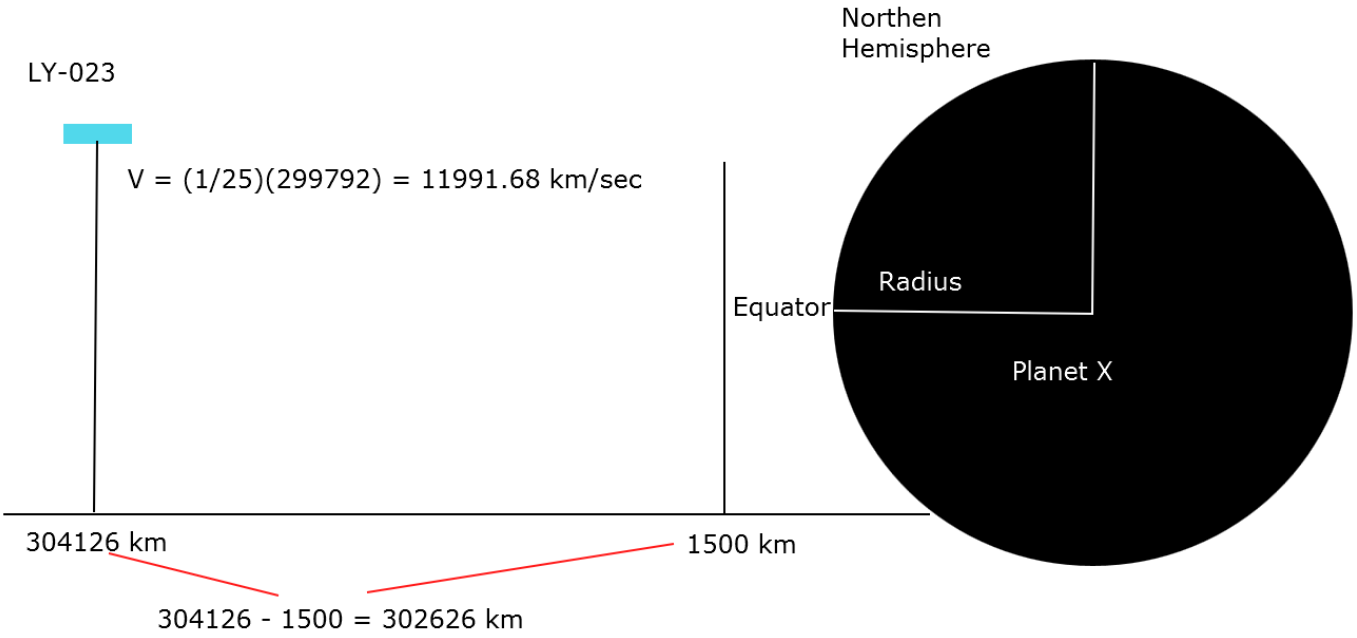
Light Beam Travel Time: Northen Hemisphere: 2.05352499567 s

Distance to Equator: 300252 km

Dinstance to Northren Hemisphere: 308000 km

Radius of Planet X = 308000 km - 300252 km = 7748 km

2. If LY-023 approaches planet X at 1/25 the speed of light when will the space probe by 1,500 km away from the planet.



Time = distance/speed = (302626 km)/11991.68 = s5 seconds.

3. You monitor LY-023's force meter there is a force of 6,000 N acting on the satellite, LY-023 has a weight of 500 kg.

What is planet X mass?

Force = Mass(acceleration) = $G\frac{M1(M2)}{r^2}$

$$6{,}000\ N = \frac{6.674(10^{-11})(MX)(500kg)}{(9{,}500)^2}$$

Multiply both sides by (9,500)^2

$$6{,}000(9{,}500^2) = \frac{6.674(10^{-11})(MX)(500\ kg)}{(9{,}500)^2}\ (9{,}500)^2$$

$$6{,}000(9{,}500^2) = (6.674(10^{-11}))(MX)(500kg)$$

Divide both sides by 500 kg

$$\frac{6{,}000(9{,}500^2)}{500\ kg} = 6.674(10^{-11})MX$$

Divide boths sides by 6.674(10^-11

$$\frac{6{,}000(9{,}500^2)}{6.674(10^{-11})(500)} = \text{Mass Planet X}$$

Mass Planet X = 1.62257(10^19) kg

4. LY-023 Starts to orbit Planet X at an altitude of 1,500 km if the probe is traveling at 15 km/s, what is the orbital period of the space ship over plant X?

5. LY-023 has successfully landed on Planet X, it uses electromagnetic waves to penetrate the surface.

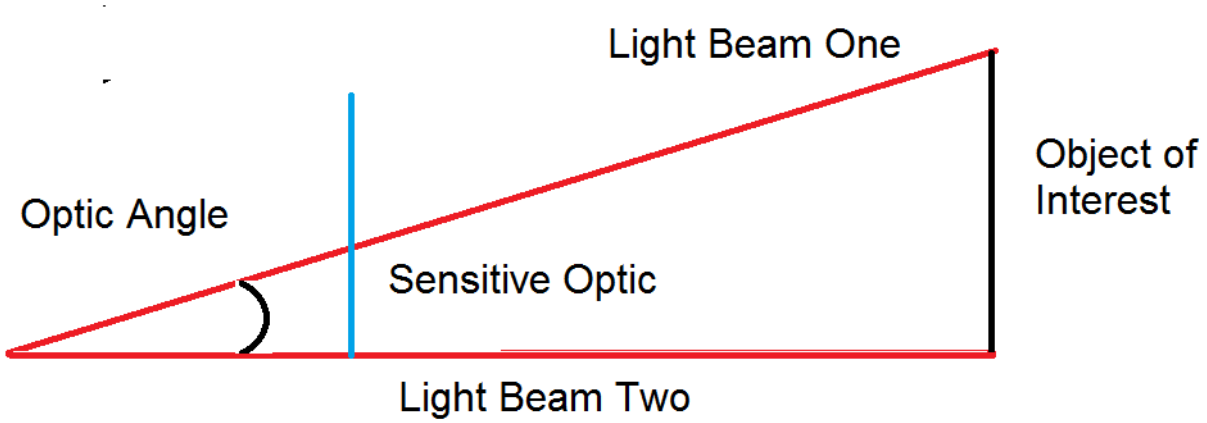
Sub layer 1:0 km - 2,000 composition, 20 % carbon, 10 % aluminum.

Sub Layer 2: has 2,000 km – 4,000 km composition: 15 % lithium, 5 % copper

Sub Layer 3: 4,000 km – 8,000 km 10 % copper 15 % Nickel.

Determine the approximate mass of each element in planet X. Assume a uniform density for planet X.

6. After penetrating the earth with electromagnetic waves LY-023, travels further along the surface of the planet. It spots an ancient temple ruin and uses similar triangles and a laser to accurately measure heights at a distance.



LY-023 adjusts the angle of both light beams such that light beam one points to the top of the temple ruin and light beam two points at the bottom of the temple ruin

The angle between the two beams is 25 degrees, the sensitive optic is 4.3 cm from the light source, and light beam one hits the sensitive optic at a height of 2 cm.

It takes 0.00714902364 seconds for light beam two to travel to the base of the temple ruin and back to the light source.

What is the height of the temple ruin?