

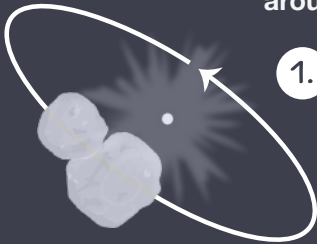


π IN THE SKY⁷

Answer Key

Cold Case

Learn a bit more about Arrokoth by calculating how long it takes the object to make one trip around the Sun.



- Using the formula for circumference, compute distance traveled by Arrokoth in one orbit.

$$C = 2\pi r$$

$$C = 2\pi(6,600,000,000 \text{ km} + 150,000,000 \text{ km})$$

$$C = 2\pi(6,750,000,000 \text{ km}) \approx 42,411,500,823 \text{ km}$$

- Convert radius kilometers to meters, then compute Arrokoth's orbital velocity.

$$V = \sqrt{\frac{GM_{\text{Sun}}}{r}}$$

$$V = \sqrt{\frac{(6.67 \times 10^{-11} \text{ m}^3 \text{kg}^{-1} \text{s}^{-2}) \cdot (2 \times 10^{30} \text{ kg})}{6.75 \times 10^{12} \text{ m}}}$$

$$V \approx 4,446 \text{ m/s}$$

- Convert circumference kilometers to meters, then use $d=rt$ compute the time it takes Arrokoth to complete one orbit.

$$t \approx (42,411,500,823,000 \text{ m}) / (4,446 \text{ m/s}) \approx 9,539,248,948 \text{ s}$$

- Convert seconds to years.

$$(9,539,248,948 \text{ s}) \cdot (1 \text{ min} / 60 \text{ s}) \cdot (1 \text{ hour} / 60 \text{ min}) \cdot$$

$$(1 \text{ day} / 24 \text{ hours}) \cdot (1 \text{ year} / 365 \text{ days}) \approx 300 \text{ years}$$

