**Answer Key**

**Pi in the Sky 7: Cold Case**

In January 2019, NASA's New Horizons spacecraft flew within 3,538 km of the most distant and primitive object explored up-close by a spacecraft. The object was originally known as 2014 MU69, but it was later renamed Arrokoth. It looks like a partially flattened, reddish snowman and is made up of two objects that merged into one. Found 6.6 billion km from Earth, Arrokoth is a small “Cold Classical” Kuiper Belt object, meaning it orbits the Sun in a nearly-circular path and has a low orbital inclination. Cold Classical objects make up about one-third of the Kuiper Belt.

One reason scientists are interested in studying Arrokoth and other Kuiper Belt objects is that they are thought to be well preserved, frozen samples of what the outer solar system was like at its birth, more than 4.5 billion years ago. **Learn a bit more about Arrokoth by calculating how long it takes the object to make one trip around the Sun.**

**Solution**

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

C = 2π r

C = 2π (6,600,000,000 km + 150,000,000 km)

C = 2π (6,750,000,000 km)

C ≈ 42,411,500,823 km

1. Convert radius kilometers to meters, then compute Arrokoth’s orbital velocity.

V = (GMSun)/r)

V=√((6.67x10^(-11) m^3kg^-1s^-2)\*(2x10^30 kg)) / 6.75 x 10^12 m)

V ≈ 4,446 m/s

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

t ≈ (42,411,500,823,000 m)/(4,446 m/s) ≈ 9,539,248,948 s

1. Convert seconds to years.

(9,539,248,948 s) \* (1 min/60 s) \* (1 hour/60 min) \* (1 day/24 hours) \* (1 year/365 day)

≈ **300 years**