

Filam Tourism Bureau
123 Marraketo Street
Tunzaboo, Filam AB83PO

Independent Mathematical Contractors
00 Anystreet
Anytown, Anystate 00000

Dear IMC:

My country is interested in developing its natural resources to better the lives of its people. Unlike many developing countries, we wish to develop our resources in a sustainable way. Our glorious president the Honorable Cesa Mucumboo commissioned a nationwide survey of the country in 2006 to ascertain what minerals, forests and other resources were available. Unfortunately, none of the resources discovered were sustainable or feasible for the long term prosperity of Filam.

In reviewing the data from this survey, I noted that several geologist collected rocks which they described as "very old". I feel that the location at which these rocks were collected could become a tourist destination if they prove to be some of the oldest rocks on the planet.

To help us determine the age of these rocks, I sent a sample of overlying rock to the University of Tunzaboo for testing. The geoscientists dated the rocks as only being 2.1 billion years old (compared to the oldest rocks at 4.25 billion years old.). Since the prosperity of our nation depends on the accuracy of these results, I need a second opinion on dating these rocks.

Potassium-argon dating was used to obtain the estimate of these rocks. Potassium-argon dating is based on the idea the potassium 40 decays into Argon 40 at a known rate. This rate is based on the half life of potassium 40 which is 1.25 billion years. This means that an original amount of potassium 40 decays by half into argon 40 every 1.25 billion years according to

$$y = y_0 e^{-kt}$$

In this equation, y_0 is the original amount of potassium 40 and y is the amount of potassium 40 at some later time t in years. The constant k is found using the half life of potassium 40.

Using an independent lab, a sample of overlying volcanic rock was found to contain $52.4 + L$ micrograms of Potassium 40 and $153.6 + L$ micrograms of Argon 40, where L is the total number of letters in your first and last name. Assume that all of the argon 40 was originally potassium 40. Based on this data and the equation above, I would like you to determine the age of the overlying rock. The underlying rock must certainly be older.

I look forward to your technical memo on this matter. A scientific expert is available to answer any questions that you might have in the course of your investigations. This expert will not be available to assist on this project over the weekend before it is due. You should plan on consulting with this expert as soon as possible.

Sincerely,
Digem Deeper
Chief of Rock Tourism