AUSTRALIAN MATHS TRUST

Maths Challenge
Intermediate: Years 9–10
Practice Problem

I3: Algae Bloom

Solutions

The earnest biologist Dr Ambitious found that what was once thought to be three species of poisonous unicellular algae were in fact three different forms of the same alga. One form is called a Kiron. It lives for one week and then instantly changes into a Liron. A Liron also lives for one week but then instantly changes into a Miron. A week later the Miron divides into one Kiron and one Liron.

Dr Ambitious puts one fresh Kiron cell in a flask of water on a Wednesday and records the number of alga cells in the middle of each following week.

a What is the total number of alga cells in the flask in week 10?

b Find the first week in which the number of alga cells in the flask exceeds 2013.

c In any week let the number of Kiron, Liron, and Miron cells be cells be x, y, z respectively. How many cells of each type will there be three weeks later?

d Show that, in each week after week 5, the number of alga cells in the flask is the sum of the number of alga cells in the flask one week earlier and five weeks earlier.