

Linear Algebra Introduction: Evelyn Boyd Granville's Favorite Challenge



Evelyn Boyd Granville in 1997

Evelyn Boyd Granville was the second black woman we know of to receive her PhD in mathematics. Dr. Granville's original research related to complex numbers but she also worked on numerous space missions, including Project Mercury, the first manned space flight program: *I can say without a doubt that this was the most interesting job of my lifetime - to be a member of a group responsible for writing computer programs to track the paths of vehicles in space* (Granville, 1989). In this worksheet we will explore topics related to her favorite challenge.

My favorite challenge to teachers and children is to solve the following problem using three different methods: Rabbits and chickens have been placed in a cage. You count 48 feet and seventeen heads. How many rabbits and how many chickens are in the cage? (Granville, 2007)

Let x = the number of rabbits and y = the number of chickens

1. In terms of x and y , how many heads are there?
2. In terms of x and y , how many feet are there?
3. Solve these equations for x and y using at least three different methods.

Extensions

4. Given a certain number of heads and feet, must a mathematical solution for the numbers of rabbits and chickens always exist? Explain why or find a counterexample.
5. Say we have a system of real-life equations modeled via

$$\begin{aligned}x + ky &= 0 \\ kx + y &= 0\end{aligned}$$

- a) Solve these equations for x and y .
- b) Must a mathematical solution for x and y always exist? Explain why or find a counterexample

- **Google Dr. Sarah** for calendar with due dates, problems, and links to all other pages (**see next page!**)
- **Homework:** Part 1 is online. Part 2 is turned in at the beginning of class. Designed to further develop your understanding and familiarity with the material and critical thinking. A good faith effort is all I ask (for online engagement you will see a completion check mark).
- **Problem Sets:** There are 4 graded problem sets over the course of the semester with annotations or explanations that demonstrate your work. Designed to apply knowledge in novel settings and approach problems from numerous points of view to draw connections and think out of the box.
- **Class Highlights:** daily overview with slides, Maple commands, and clicker questions
- **ASU Learn:** Part 1 of the homework, solutions, discussion forums, glossary, link for Zoom