BOISE STATE UNIVERSITY

DEPARTMENT OF MATHEMATICS

Problem of the Month **September 2025**

The Water Jugs Problem

A classic problem in discrete mathematics involves measuring different amounts of water using two water jugs. In fact, this problem is so famous, it has even been featured in Die Hard 3.

So, what is the actual problem?
Well, we'll start with the problem from the movie!
Optional: watch the problem statement from Die Hard 3 here (it is cut to not reveal their solution)

Part 1: Solve the Problem

You have two unmarked containers measuring exactly 3 gallons and 5 gallons.
You also have running water.
How can you use the containers to measure exactly 4 gallons of water?

Try to solve the original problem!

Part 2: Extensions
Once you've solved that problem, let's take it a step further and explore some different problems:

- If, instead, we had 4 gallon and 9 gallon jugs (or buckets), how many different whole number amounts could we measure?
- What if it was 4 and 10?
- What if you had an n-gallon jug and an m-gallon jug?

How to participate
Have fun thinking about this problem and sharing it with your friends and family!

If you are excited about the work you've done, please share your solutions and creative problem solving with mathoutreach@boisestate.edu! Solutions can be created digitally (e.g. sharing a Desmos graph you created with an emailed explanation), or they can be done on paper or in other physical formats and sent via pictures or a scanned PDF. If you are a student, please include your grade, your school, and the name of your math teacher. The most creative and clear solutions sent in before the end of the month will win prizes and shoutouts!

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