

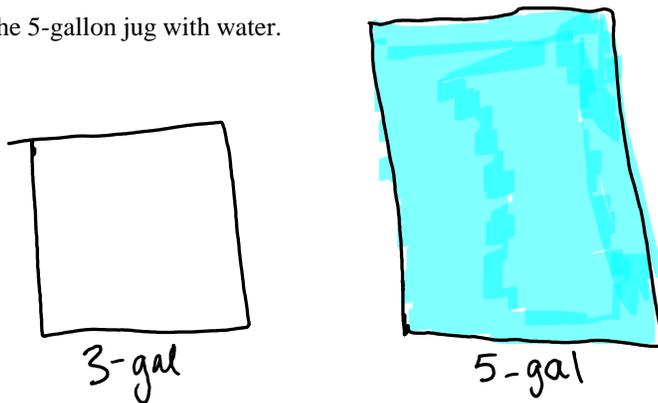
Consider the following scenario (from the movie Die Hard With a Vengeance). Suppose you have a jug that can hold 3 gallons of water, a jug that can hold 5 gallons of water, and a pool of water for which to fill the jugs. The challenge is to figure out how to put exactly 4 gallons of water in the 5-gallon jug! You can't approximate or guess, you need exactly 4 gallons in the jug. In the movie, if the jug with 4 gallons of water didn't weigh correctly, a bomb was to go off in the city! Can you find a way to get 4 gallons in the 5-gallon jug?

Solution: As with any problem, there are multiple ways to get 4 gallons into the 5 gallon jug. Let's take a look at one option and lay out the steps. Note, this may not be the fastest way.

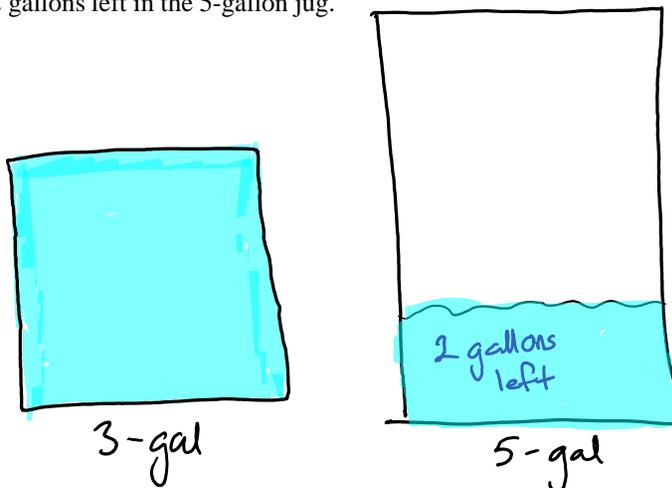
Here's what we have to work with, a 3-gallon jug, a 5-gallon jug, and a pool of water to fill the jugs.



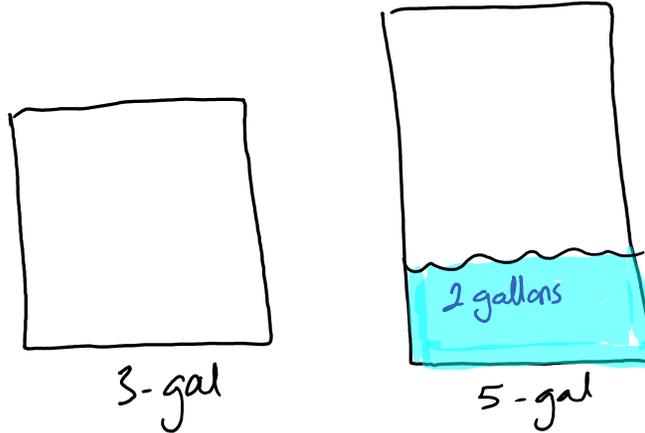
Step 1: Fill the 5-gallon jug with water.



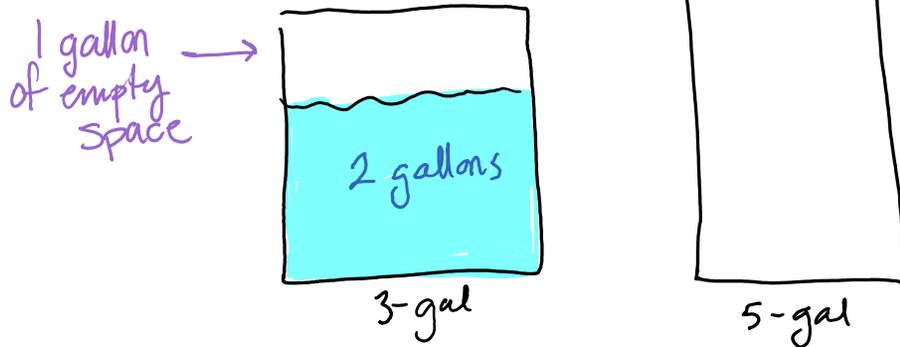
Step 2: Using the full 5-gallon jug, fill the 3-gallon jug. Thus leaving a full 3-gallon jug and 2 gallons left in the 5-gallon jug.



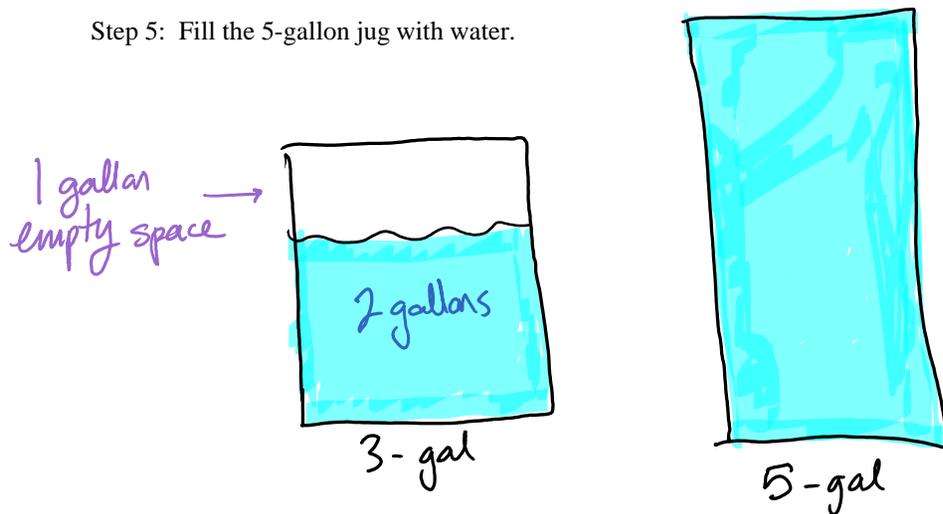
Step 3: Pour out the 3 gallons of water from the 3-gallon jug, leaving it empty.



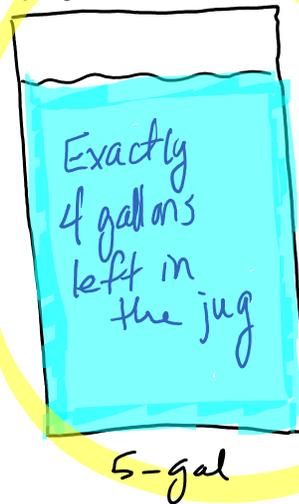
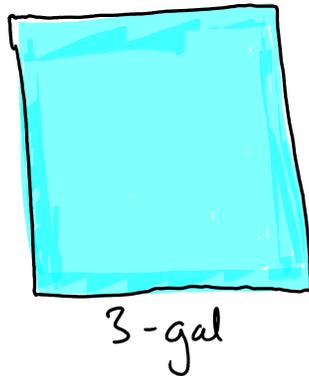
Step 4: Pour the 2 gallons in the 5-gallon jug into the empty 3-gallon jug. Leaving 1 gallon of empty space in the 3-gallon jug.



Step 5: Fill the 5-gallon jug with water.



Step 6: Using the full 5-gallon jug, pour 1 gallon into the 3-gallon jug, filling that empty space with water and thus making it full. Now, since you just took the 5-gallon jug and pulled out 1 gallon, you are left with exactly 4 gallons in the 5-gallon jug! You did it!



The city is saved!