

Jug-Pouring Problems

Variations of jug pouring problems have been around since the 13th century. In the 1995 movie *Die Hard with a Vengeance*, the protagonists, John McClain (Bruce Willis) and Zeus (Samuel L. Jackson), are instructed by the evil Simon Gruber (Jeremy Irons) to measure out exactly **four** gallons from **five** and **three** gallon jugs in just a few minutes to disarm a bomb.

There is an endless supply of water. When we fill a jug, it must be filled to capacity; we can also pour out the entire contents of a jug.



<http://www.youtube.com/watch?v=lZ64IR2bz5o>

- Solution:* 5 3 gallon jugs
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|----|---|---|--|
| | 0 | 0 | both empty |
| 1. | 5 | 0 | fill 5-gal jug |
| 2. | 2 | 3 | fill 3-gal jug from 5-gal jug |
| 3. | 2 | 0 | empty 3-gal jug |
| 4. | 0 | 2 | pour 2 gal from 5-gal jug into 3-gal jug |
| 5. | 5 | 2 | fill 5 gal jug (again) |
| 6. | 4 | 3 | pour from the 5-gal jug enough to fill the 3-gal jug which leaves exactly 4 gal in the 5-gal jug |

