The Problem:
Imagine that you had two “hour” glasses, i.e. glasses that measure the pas-
sage of time by how long it takes sand to flow from one chamber to another. 
Suppose that one glass measures exactly 9 minutes while the other measures 
precisely 13 minutes. There are no markings to measure portions of these 
two times. Is it possible to measure exactly 30 minutes? If not, prove this. 
If it is possible, give a method.

A Solution:

It is possible. Here’s a way to do it: Turn over the glass that measures 13 
minutes. When its upper chamber is empty, turn it over. At the same time, 
turn over the glass that measures 9 minutes. When the upper chamber of the 
9-minute glass is empty, turn it over. This happens 22 minutes after we first 
turned over the 13-minute glass since $22 = 13 + 9$. When the upper chamber 
of the 13-minute glass is empty (26 minutes since the start), turn the 9-
minute glass back over, even though the upper chamber is not empty. Four 
minutes have elapsed since it was first turned over (at 22 minutes after the 
start), so there are 4 minutes of sand left in its upper chamber once it is 
turned back over. Four minutes from the 26-minute mark yields exactly 30 
minutes. This is what we wished to achieve.

Congratulations to Matthew Delio and Carlos Salgado for correctly solving 
this problem!