# THE CHINESE REMAINDER THEOREM

## Two historical versions:

Sun Tsu Suan-Ching (4th century AD):

*There are certain things whose number is unknown. Repeatedly divided by*3,*the remainder is*2;*by*5*the remainder is*3;*and by*7*the remainder is*2.*What will be the number?*

 *Brahma-Sphuta-Siddhanta* (Brahma's Correct System) by Brahmagupta (born 598 AD):

*An old woman goes to the market with a basket of eggs. She sets the basket down and a horse accidentally steps on it, crushing all the eggs. The rider offers to pay her for the damaged eggs and asks how many eggs did she have. She tells the rider that she cannot remember but that when she had taken all of the eggs out 3 at a time, there were 2 left in the basket. When she took them out 5 at a time, there were 3 left and when she took them out 7 at a time, there were 2 left. What is the smallest number of eggs she could have had?*

## Hsin Tsai-Wei’s solution to the problem

*Three man walk together, their chance of reaching seventy so slight.*

*Among the five plum trees, twenty-one blossoms did they yield.*

*Seven sons at mid-month, happily did reunite.*

*Divide this sum by 105, the answer is revealed.*

## What?

The modern way to state the problem is that we are looking for a number X such that

X = 2 (mod 3)

X = 3 (mod 5)

X = 2 (mod 7)

The answer that is being provided is that

X = 2 \* 70 + 3\* 21 + 2 \* 15 (mod 105)

X = 23 (mod 105)

Hey, it works!

