1. *Famous alphametic.* A puzzle in which the digits in a correct mathematical expression, such as a sum, are replaced by letters is called ***crytarithm***; if in addition, the puzzle's words make sense, it is said to be alphametic. The most well-known ***alphametic*** was published y renowned British puzzlist H.E. Dudeney (1857 – 1930):

```
  S E N D
+ M O R E
---------
M O N E Y
```

Two conditions are assumed: first, the correspondence between letters and decimal digits is one-to-one. i.e., each letter represents one digit only and different letters represent different digits; second, the digit zero does not appear as the left-most digit in any of the numbers. To solve an alphametic means to find which digit each letter represents. Note that a solution's uniqueness cannot be assumed and has to be verified by the solver.

Here is another alphametic:

```
  W I N E
+ M E A T
---------
F E A S T
```

Solve both puzzles the way they were expected to be solved when Dudeney's puzzle was first published in 1924.

2. We have apparently *n* identical gold coins. One of them is an amalgam and is lighter, but is otherwise indistinguishable from the others. We also have a balance with two pans where any measurement will tell us only if the loaded pans weigh the same or, if not, which one weights more.
    a) How many measurements are necessary and sufficient to find the false gold coin?
    b) What happens if we don't know if the false coin is lighter or heavier?

3. Each of *n* surgeons must separately operate on each of *n* patients. However, surgeons don't want to catch the patients' diseases, nor do they want to infect any patient with any other patient's disease. Clinical procedure requires that no glove surface touched by a doctor should

touch a patient. Assume that each surgeon refuses to touch a glove surface that another surgeon has touched. Show that two surgeons can operate on two patients using only two surgical gloves in all.

4. Two men have a full eight-gallon jug of wine, and also two empty jugs of five and three gallon capacity, respectively. What is the simplest way for them to divide the wine equally?

5. Problem #3 page #106

6. Problem #8 – page #129