List of Problems: Choose One for Your Own Chapter Of *The Man Who Counted*

1. **Lunch at the TL Club.** Every member of the TL club is either a truther, who always tells the truth, or a liar, who always lies. When I visited the club for the first time, I found its members (all men) all seated around a large circular table having lunch. There was no way to distinguish truthers from liars by their appearance, so I asked each man in turn which he was. This proved unenlightening. Each man naturally assured me he was a truther. I tried again, this time asking each man whether the man on his left was a truther or a liar. To my surprise, each told me the man on his left was a liar.

Later in the day, back home and typing up my notes on the luncheon, I discovered I had forgotten to record the number of men at the table. I telephoned the club’s president. He told me the number was 37. After hanging up, I realized I could not be sure of this figure because I did not know whether the president was a truther or a liar. I then telephoned the club’s secretary.

“No, no,” the secretary said. “Our president, unfortunately, is an unmitigated liar. There were actually 40 men at the table.”

Which man, if either, should I believe? Suddenly I saw a simple way to resolve the matter. Determine how many men were seated at the table.

2. **The economy cut.** Emma was always looking for ways to save money. While in the remnant shop she came across just the material she wanted to make a table-cloth.  

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+----+----+----+
|    |    |    |
| 5 m|    |    |
+----+----+----+
|    |    |    |
| 2 m|    |    |
+----+----+----+
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Unfortunately the piece of material was in the form of a 2m x 5m rectangle and her table was 3m square. She bought it however having decided that the area was more than enough to cover the table. When she got home however she decided she had been a fool because she couldn’t see how to cut up the material to make a square. But as she despaired she had a brainwave, and with 3 straight cuts, in no time at all, she had 5 pieces which fit neatly together in a symmetric pattern to form a square using all the material. How did she do this?

3. **The dishonest gold exporter.** Because gold is such a precious metal an exporter tried to make money by melting down the genuine gold ingots and recasting them in moulds which produced ingots which were one gram light. The customs officers became aware of this fraud from an undercover agent and set about trying to find the light ingots.

In their bounded warehouse at the time they had several consignments of 100 ingots each made up of 10 piles of 10 ingots. Their information told them that one pile of 10 ingots in each consignment came from the dishonest exporter and they wanted to find an efficient way of finding the light pile in each consignment. After some thought a customs officer came up with a neat method which enabled them to find the light pile in each consignment using just one weighing. How was it done?
4. **Divisibility.** Can you arrange the digits 1,2,3,4,5,6,7,8,9 in an order so that:
   The number formed by the first two digits is divisible by 2,
   the number formed by the first three digits is divisible by 3,
   the number formed by the first four digits is divisible by 4,
   and so on up to nine digits?

5. **The variable menu.** The owner of a café had many regular customers. So as not to bore them with a monotonous menu, she devised a plan which would ensure that no two meals should repeat themselves for at least a year. She saw each meal as basically consisting of 4 parts (i) potatoes or equivalent, (ii) meat or fish, (iii) a vegetable, (iv) a sweet. Her solution is embodied in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Pork</th>
<th>Peas</th>
<th>Apple pie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiled potatoes</td>
<td>Lamb</td>
<td>Carrots</td>
<td>Ice cream</td>
</tr>
<tr>
<td>Roast potatoes</td>
<td>Chicken</td>
<td>Sweet corn</td>
<td>Fruit salad</td>
</tr>
<tr>
<td>Rice</td>
<td>Fish</td>
<td>Cabbage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beef</td>
<td>Cauliflower</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brussels sprouts</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Broad beans</td>
<td></td>
</tr>
</tbody>
</table>

Starting on the first day of the year she served chips, pork, peas and apple pie and on each succeeding day she replaced each part of the meal by the next ingredient in the table. The next ingredient to the one at the bottom of a column being the one at the top so, for example, if on one day the meal was rice, fish, broad beans, and apple pie, on the next day it would be chips, beef, peas, and ice cream.

How many days pass before a meal repeats itself?
What meal is served on day 100 from the start of the scheme?
On what day would you expect to be served roast potatoes, lamb, Brussels sprouts and apple pie?

6. **Creepy Crawlies** Rochelle collects lizards, beetles, and worms. She has more worms than lizards and beetles together. Altogether in the collection there are twelve heads and twenty-six legs. How many lizards does Rochelle have?

7. **Intersecting lines.** Five straight lines can be drawn in a plane in an infinite number of ways. They could be parallel as in (a) when they do not cross anywhere, or all pass through one point as in (b). The largest number of intersections obtainable is 10 as in (c).
Can you find a way to draw 5 lines with only 8 intersections? Can you find a second way? Now show how to draw 10 lines so that they make 27 intersections.

Two friends are talking about their families after work.
One of them tells the other, “The product of the ages (in years) of my three children is 36, and the sum of their ages is exactly the number of your house. Can you tell me their ages?”

“In fact, I can’t. I need another clue.” said the other friend immediately.

“You are right, “ answered, with admiration, the father of the children. “The oldest one plays the piano.”

What are the ages of the children?