**PUZZLE I**

1. A Wolf, a Goat, and a Cabbage
   A man finds himself on a riverbank with a wolf, a goat, and a head of cabbage. He needs to transport all three to the other side of the river in his boat. However, the boat has room for only the man himself and one other item (either the wolf, the goat, or the cabbage). In his absence, the wolf would eat the goat, and the goat would eat the cabbage. Show how the man can get all these "passengers" to the other side.

2. A Fake Among Eight Coins
   There are eight identical-looking coins; one of these coins is counterfeit and is known to be lighter than the genuine coins. What is the minimum number of weighing's needed to identify the fake coin with a two-pan balance scale without weights?

3. Page Numbering
   Pages of a book are numbered sequentially starting with 1. If the total number of decimal digits used is equal to 1578, how many pages are there in the book?

**PUZZLE II**

| | | | | | | |
|---|---|---|---|---|---|---|
| | 16 | 28 | 14 | 17 | 4 | 25 |
| | | 23 | 17 | 24 | 12 | 16 |
| 12 | | | 26 | 26 | 16 | 23 |
| 17 | 23 | | | 5 | 27 | 26 |
| 25 | 27 | 17 | | | 17 | 6 |
| 16 | 4 | 26 | 26 | | | 13 |
| 25 | 12 | 17 | 4 | 24 | | |

Fill in the empty cells such that sum of each row, column and diagonal is the same.

**<u>Challenge:</u>** Where does the diagonal lead to?

**<u>Hint:</u>**

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |

**SET I**

1. In the Parliament of Sikinia, each member has at most three enemies. Prove that the house can be separated into two houses, so that each member has at most one enemy in his own house.

2. Many handshakes are exchanged at a big international congress. We call a person an odd person if he has exchanged an odd number of handshakes. Otherwise he will be called an even person. Show that, at any moment, there is an even number of odd persons.

3. A dragon has 100 heads. A knight can cut off 15, 17, 20, or 5 heads, respectively, with one blow of his sword. In each of these cases, 24, 2, 14, or 17 new heads grow on its shoulders. If all heads are blown off, the dragon dies. Can the dragon ever die?

**SET II**

1. A rectangular floor is covered by $2 \times 2$ and $1 \times 4$ tiles. One tile got smashed. There is a tile of the other kind available. Show that the floor cannot be covered by rearranging the tiles.

2. Is there a way to pack 250 $1\times1\times4$ bricks into a $10\times10\times10$ box?

3. Which of the statements, if any, are false?

   1. At least 1 of the statements in this list is false.
   2. At least 2 of the statements in this list are false.
   3. At least 3 of the statements in this list are false.
   4. At least 4 of the statements in this list are false.
   5. At least 5 of the statements in this list are false.
   6. At least 6 of the statements in this list are false.
   7. At least 7 of the statements in this list are false.
   8. At least 8 of the statements in this list are false.
   9. At least 9 of the statements in this list are false.
   10. At least 10 of the statements in this list are false.

**SET III**

1. A chess-master has 77 days to prepare for a tournament. He wants to play at least one game per day, but not more than 132 games on any day. Prove that there is a sequence of successive days on which he plays exactly 21 games.

2. A $20\times20\times20$ cube is built of $1\times2\times2$ bricks. Prove that one can pierce it by a needle without damaging one of the bricks.

3. Along a circle are written 4 ones and 5 zeros. Then between two equal numbers we write a one and between two distinct numbers zero. Finally the original numbers are wiped out. This step is repeated. In this way can we ever reach 9 ones?