

### 1. Liar's Bingo

This game is played with strips of six numbers like the one below:

16	76	46	52	54	57
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Each participant should be given several strips (6 is good since they can then be assembled into a  $6 \times 6$  "bingo card") and should play with them for a while. Then the trick occurs: a participant picks a strip and reads the colors from left to right, but lies about *exactly one* of the colors. The facilitator will then amaze the audience by naming the number whose color the participant lied about.

### 1. Liar's Bingo

The color coding is in binary, where red is 1 and black is 0. When the participant gives a six-color sequence, the first three colors give (in binary) the tens digit and the last three colors give the ones digit. For example, using the strip on page 1, the statement "red-black-black-red-red-black" would be decoded as red-black-black =  $100_2 = 4$  and red-red-black =  $110_2 = 6$ , so the lied-about number was 46.

Some hints that this is what's going on:

- The digits 8 and 9 do not appear on any of the strips
- The first three numbers on each strip have the same units digit
- The last three numbers on each strip have the same tens digit

There are necessarily  $2^6 = 64$  possible strips, and once you decide on the colors of a strip, the numbers are uniquely determined. Furthermore, each number appears on exactly 6 strips. A fun exercise is: given two legal numbers (no digits of 8 or 9) can you make a strip on which both numbers appear?