



Advanced Mathematics
Support Programme®

Mind Reading Trick

10 Card trick to amaze people

First thoughts – these can be answered in any order

- Do you notice anything about the numbers of counters that were being used?

- Did it matter which pile the counters were placed? Would you get the same result if you changed the split of the counters?

- Would you get the same result if you used different numbers of counters? Can you justify your answer?

Second activity – decoding the trick.

Turning over the cards may help you answer these questions and analyse the mechanics of why the trick works.

- Start with 3 cards.
- Cut the cards a few times.
- Deal the top 3 out and put the next 3 down in the other pile.

- How many counters(swaps) will you need for the first pair? How many counters(swaps) for the second and third pairs?

- What if you used a different amount of counters (swaps)? Try increasing the counters amount by one each time, record which numbers of counters result in pairs and which don't.

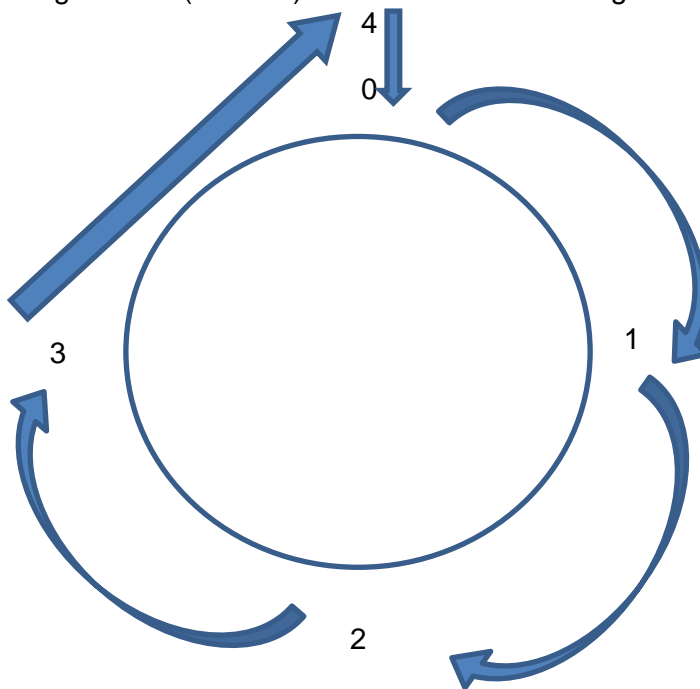
- What happens if you shuffle the cards rather than just cut them? Does the trick still work?

Third activity – repeating the trick

- Start with 4 pairs. Can you run the trick from start to finish so it works? Describe the steps below and run the trick on your partner to ensure it works.

Fourth activity – extending the trick

The trick works by using modulo (or clock) arithmetic. Here's a diagram that shows how modulo arithmetic base 5 works.



For example, using modulo 4 (which we say is Mod 4), we can see that $6 \text{ mod } 4$ is 2.

- Using modulo arithmetic we can see the different numbers of swaps we can use at each stage of the trick. Complete the table giving more than one answer.

Number of cards	Number of coins
8	
7	
6	
5	
4	
3	
2	

Martin Gardner was an amazing recreational mathematician who explored all sorts of mathematically interesting tricks including card tricks. For this one, he presented the 'swaps' as using the letters in the phrase 'last two cards match'.

Using your understanding of modulo arithmetic, can you explain why the phrase 'last (4) two (3) cards (5) match (5)' works as a way of carrying out this trick.

Can you create your own phrase or scenario to personalise the trick? You don't have to start with 10 cards. You could start with 8, or 12, or 14, or any even number. You could even use the whole deck!
