












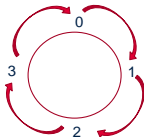














Slide 1	 <p>Advanced Mathematics Support Programme®</p>	
Slide 2	 <p>Reading Minds...</p>	
Slide 3	 <p>Mind Reading Trick</p> <ul style="list-style-type: none"> ▪ This trick enables you to look like you're reading someone's mind... • Watch this video 	<p>If leading this in a classroom, you may want to demonstrate this trick (a visualiser OR large cards would be useful) or use the link. Only demonstrate it once, you could demonstrate the set up again if you felt it beneficial but allow students to explore the coin mechanics themselves.</p>
Slide 4	 <p>How it works</p> <p>It will help if you have a pack of cards to help, or you can make your own! In a normal pack of cards, choose the same numbers (from different suits). If you make your own set of cards, you will need two of each picture – the more different the better!</p>	
Slide 5	 <p>Thinking about the trick</p> <ul style="list-style-type: none"> ▪ What did you notice about the number of counters being used? ▪ Do you think it mattered where the counters were placed? ▪ Do you think it matters how many counters were being placed? 	<p>Generate some discussion to see what students have noticed from the trick. Don't give too much away, see what conclusions they have drawn. Some will be wrong at this stage, and that's ok.</p>
Slide 6	 <p>Unpicking the trick</p> <p>Trying the trick with the cards face up may help you answer these questions and analyse the mechanics of why the trick works.</p> <ul style="list-style-type: none"> ▪ It might help to work backwards 	<p>Using the cards upturned is very useful. Students can see that it doesn't matter where you cut the cards, but there must be one of each number in each pile, in reverse order.</p>
Slide 7	 <p>Unpicking the trick (hint)</p> <p>Trying the trick with the cards face up may help you answer these questions and analyse the mechanics of why the trick works.</p> <ul style="list-style-type: none"> • Start with a pair of cards • Add another pair on top • Do one swap (remember to move the card from bottom to top) • Add another pair on top and do two swaps • 'Undeal' one pile and put them on top of the other pile ▪ What do you notice about the order of the cards? 	<p>Using the cards upturned is very useful. Students can see that it doesn't matter where you cut the cards, but there must be one of each number in each pile, in reverse order.</p>

Slide 8	  <h3>Unpicking the trick</h3> <ul style="list-style-type: none"> Can you use different amounts of counters (swaps) and get the same result? <ul style="list-style-type: none"> Does how you choose to set up the cards matter? Can you shuffle them? Do you have to cut them in a certain place? Does the order matter? 	Using the cards upturned is very useful. Students can see that it doesn't matter where you cut the cards, but there must be one of each number in each pile, in reverse order.																
Slide 9	  <h3>Unpicking the trick</h3> <ul style="list-style-type: none"> Start with 4 pairs. How many counters can you start with in which piles? Can you create the trick straight away? 	Start to guide the students to see if they realise that you can do this trick with 3 moves, or 7 moves, or 11 moves etc for 4 counters. They might describe it as $4n-1$.																
Slide 10	  <h3>Modulo arithmetic</h3> <ul style="list-style-type: none"> The trick works on modulo arithmetic. Modulo arithmetic is also called clock arithmetic, and is best understood by a diagram such as this  <p>This is a modulo four, or Mod 4 diagram. Use the diagram to show that</p> <ul style="list-style-type: none"> $6 \text{ Mod } 4 = 2$ $11 \text{ Mod } 4 = 3$ $8 \text{ Mod } 4 = 0$ 	Emphasise that in Mod 4, you don't see a number greater than 3.																
Slide 11	  <h3>Unpicking the trick</h3> <ul style="list-style-type: none"> Now you should be able to change the trick. The trick is based on clock arithmetic. After completing the trick, can you fill in this table <table border="1" data-bbox="261 1099 523 1227"> <thead> <tr> <th>Number of cards</th> <th>Number of counters</th> </tr> </thead> <tbody> <tr><td>8</td><td></td></tr> <tr><td>7</td><td></td></tr> <tr><td>6</td><td></td></tr> <tr><td>5</td><td></td></tr> <tr><td>4</td><td></td></tr> <tr><td>3</td><td></td></tr> <tr><td>2</td><td></td></tr> </tbody> </table>	Number of cards	Number of counters	8		7		6		5		4		3		2		
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Slide 12	  <h3>Extending the trick</h3> <ul style="list-style-type: none"> Martin Gardner (an amazing recreational mathematician) presented this trick using the number of letters in each words of the phrase 'last two cards match' so the first swaps would have 4 swaps, then 3, then 5, then 5. Can you explain how this works? Can you make your own phrase? You don't have to start with 10 cards, you could start with 8, or 12, or even the whole deck! 	Students can use their own ideas to come up with a funny phrase, or joke, or a twist. You could encourage your students to share these with you!																
Slide 13	  <h3>Other Activities</h3> <ul style="list-style-type: none"> You may want to try other card tricks or activities: <p>amsp.org.uk/resource/maths-club-activities</p>	You may want to ask your students to send you images of them performing the trick or ask them to do this live if you have an online classroom. Or ask them to show you a different card trick																
Slide 14	  <h3>Contact the AMSP</h3> <ul style="list-style-type: none">  01225 716 492  admin@amsp.org.uk  amsp.org.uk  Advanced_Maths 	Stay informed about the AMSP and receive updates: https://amsp.org.uk/subscribe																