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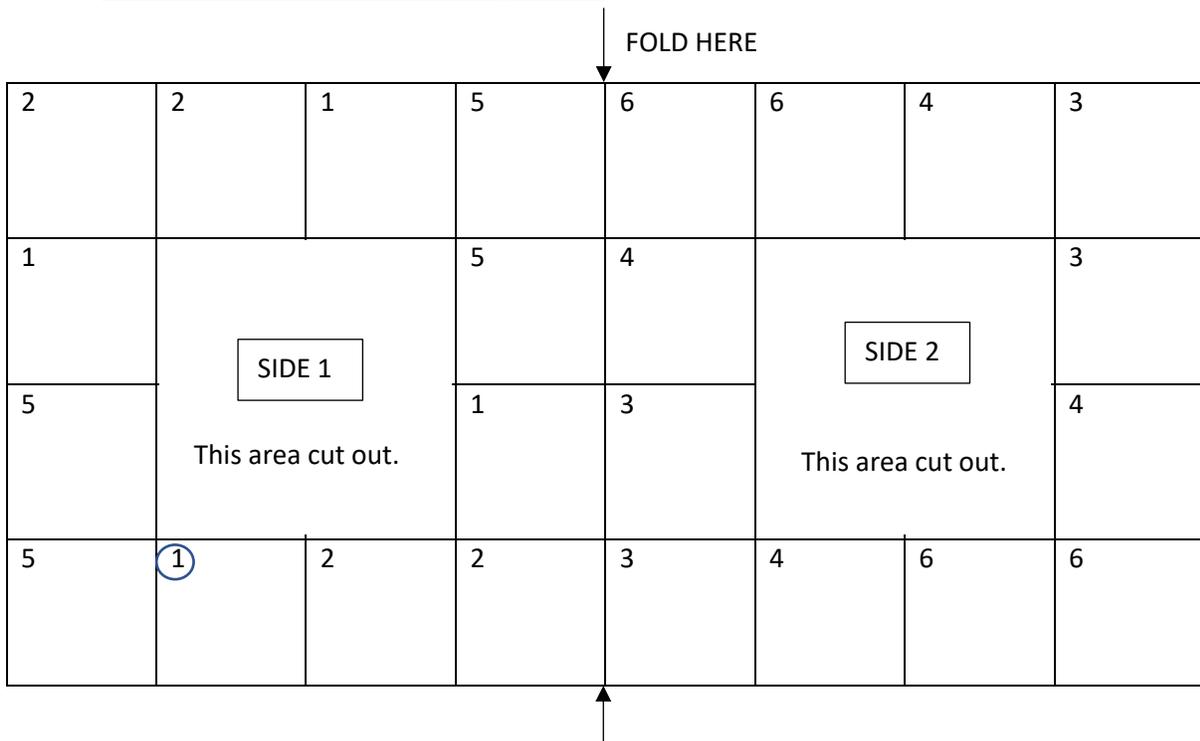
One night, after binging on Vi Hart videos and relishing in her awesomeness, my trick 'Secret Paths' suddenly wrapped and wriggled itself around a square flexagon and traversed to my cerebral cortex for some attention (always so needy). Subsequently, an exciting 1½ weeks was spent designing and mapping this idea. Normally, I shoo away these unwelcomed mental intrusions but felt this was an interesting idea so I allowed it to come forth and present itself. I'm glad I did; the result is pretty awesome. So, I dedicate this combination of binary and square flexagon curiosity and mentalism trick to the amazing Vi Hart, the internet's mathematical genius & math art goddess. She considers herself a 'mathmusician' btw.

The properties of the square flexagon allow for a convincer that will throw a wrench into any brain who may suspect binary inner-play. They will be correct in their assumption but doubt it with the built-in dis-prover. I'll explain later. So, for your magical amusement I present 'Perplexagon', the origami-based mental magic piece.

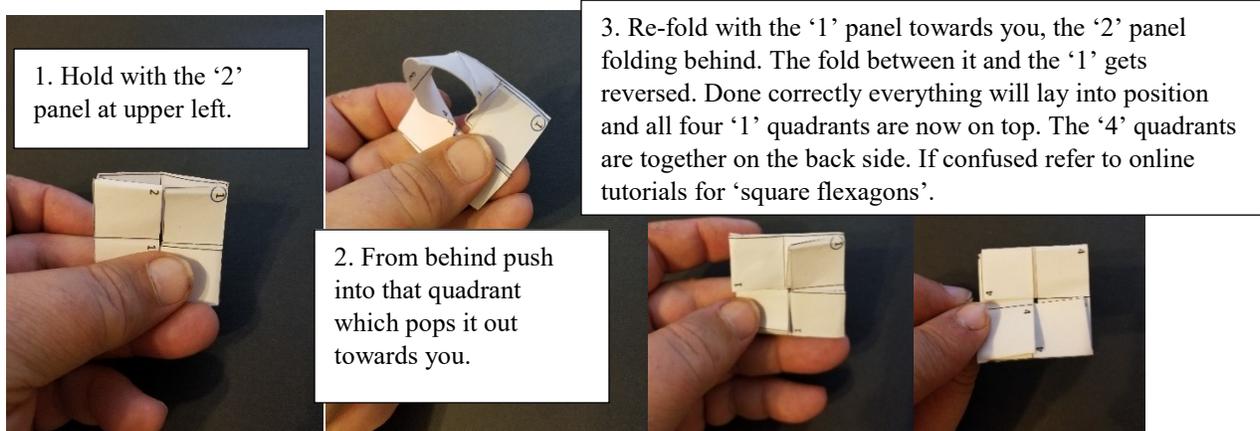
Effect: This prop can be used for one or two spectators.

- A. 3 discs with different colors on each side are tossed onto a table and the 3 random colors on their tops are noted. A small packet of 8 cards are now shown. Each has a random shape on it. The spectator selects one. Now, a flexagon is displayed. Its triangular segments are individually colored and with various symbols drawn on them. By activating the flexagon's origami property, various symbols and colors appear as new sides are revealed. The spectator freely chooses a starting point and travels through the flexagon, following a random path according to his freely chosen colors and shapes. His randomly ended symbol matches the one on his card selection! The trick can be repeated on the same person, even with the same color pattern if he desires! This is where, if you're a magician and thinking binary, you're scratching your head right now. Ha ha, that'll teach you. I'll explain a little later.
- B. Without using the chips and packet, the magician looks upwards and request the spectator pick a color showing and remember the symbol inside that triangle. The flexagon is activated and the spectator follows a random path, finally ending at one symbol. She concentrated and the magician reveals it!

C. Two spectators travel through the Perplexagon for a double prediction, even with the same color patterns should they desire, or different ones.



For teaching purposes, we're going to make the square flexagon in the illustration above. The actual prop is a few pages further. Print this out and fold in half then glue together where there are numbers on both sides (as a reference, looking at the top row the '2' and '3' will be back-to-back, as is the '2' and '4', the '1' and '6', the '5' and '6'). Note: The print isn't very large and if your paper is thick it may be difficult to manage. If that's the case just print one of the sides then write the numbers in on the other side. Once built, fold into fourths both directions, following the horizontal and vertical lines, then cut out the center where you now have a number ring. To fold the flexagon; With side 1 facing you; Fold the top row down towards you, then the right, then the bottom, then the left. Flip it over where the '1' side is showing. Tuck and reverse the 'odd' quadrant (a '2' is showing on it) which locks the flexagon into shape, like this:



The square flexagon is now locked into position and can be played with. An excellent feature of the square flexagon is no glue or extras is needed to form it into the working model.

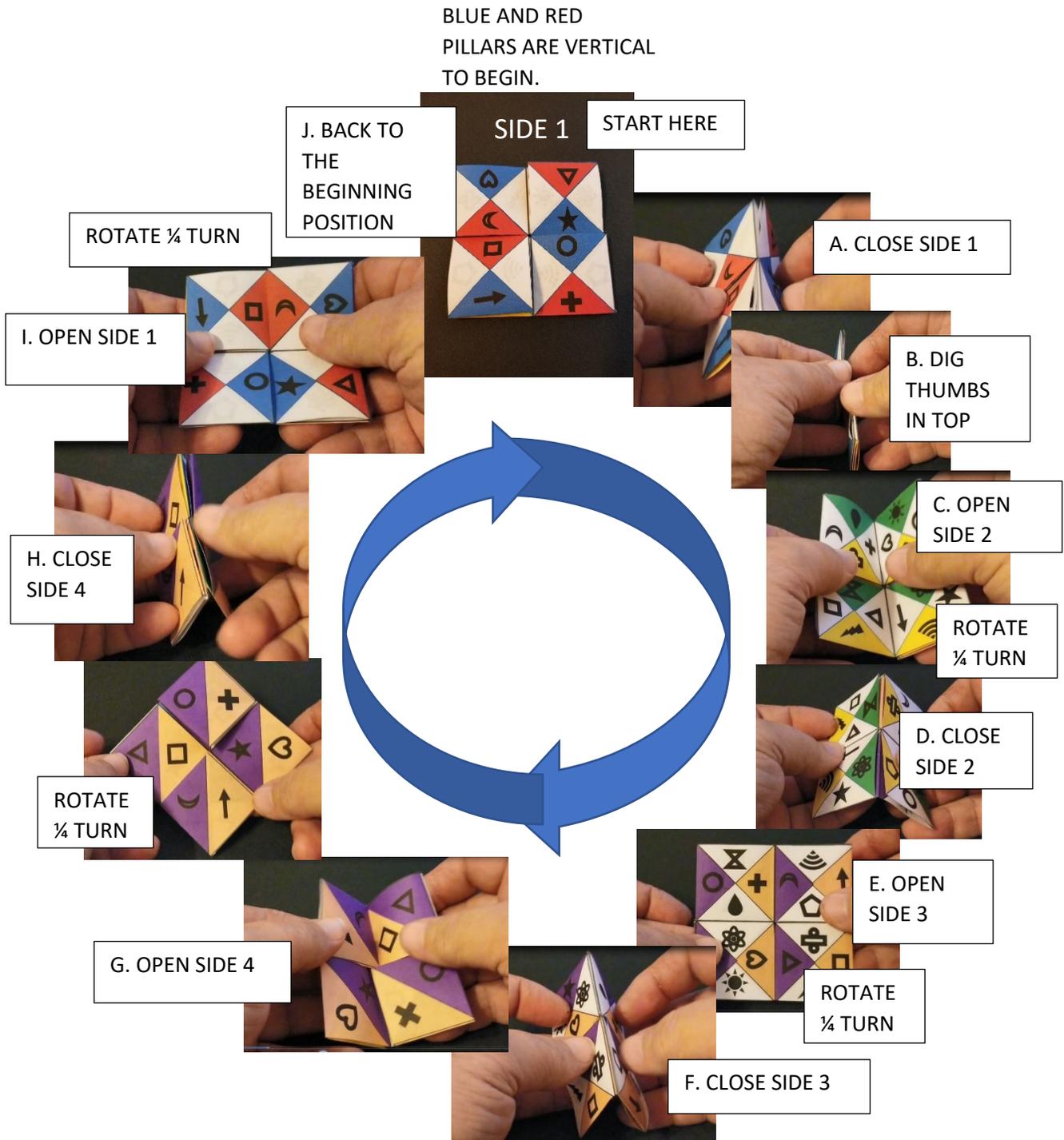
Once assembled, hold the flexagon with the circled '1' the top left quadrant. Mountain fold the left and right halves downward at the center vertical line and unfold from the center, in standard flexagon manner. You should be seeing '2's now. Rotate the flexagon $\frac{1}{4}$ turn either direction. Do the flexagon folding and unfolding again at the vertical center and side '3' will show. Rotate a $\frac{1}{4}$ turn again and do the flexagon fold and unfold to show side '4'. Rotate $\frac{1}{4}$ turn and do the flexagon fold and unfold again and you're back at side '1'. Rotate $\frac{1}{4}$ turn and you're back at the beginning position. The rotation of sides 1 - 4 can be done continuously, as much as desired. If the flexagon action is started the vertical fold and when the circled-number quadrant is at upper-left, two secret portions of the flexagon will never come into view, even if someone else does it. Unless the person is into geometry and has knowledge of square flexagons they'll have no idea there are two more sides remaining hidden. Even if they do they'll not notice any differences. In their minds, seeing four portions makes sense; a square has four sides and you show four sides of the flexagon. People naturally associate a square with the number four, so one could say this prop has built-in mental misdirection, of course I don't know who'd you'd say it to, maybe your wife or mom. I doubt either will give a flying rat's ass, lol. To show the two 'secret' sides, in the beginning, on side '1', rotate the flexagon $\frac{1}{4}$ turn where the circled '1' is in the top right quadrant, then fold and unfold at the vertical center as per standard square flexagon procedure. Side '5' will come into view. Rotate $\frac{1}{4}$ turn and do the flexagon move to show side '6'. Rotate $\frac{1}{4}$ turn and do the flexagon move which shows side '4'. Rotate $\frac{1}{4}$ turn and do the flexagon move to be back at side '1'. I've adjusted the map direction of sides '5' & '6' where the final ending symbol will be 'four' positions away from the other, either direction. In other words, using the chips 3 random color pattern for two people, one person is shown sides 1 - 2 - 3 - 4, the other person is shown sides 1 - 5 - 6 - 4. Their two seemingly random ending symbols will be 4 apart from each other. Though there are 16 different shapes on the flexagon, only eight of them can be ended on. They are:

- 1 - circle
- 2 - plus sign
- 3 - triangle
- 4 - square
- 5 - star
- 6 - heart
- 7 - crescent moon
- 8 - arrow

Notice that 1 - 5 are your standard arrangement as used in many e.s.p. tricks for easy memorization: the circle is '1' continuous line, plus sign is '2' lines, the triangle has '3' sides, the square '4' lines, & star consists of '5' lines. The 6 and heart is associated by the term 'love sick' (love is the heart, 'sick' is phonetically like 'six'). The '7' and crescent moon are associated by the phrase '7th heaven', and the arrow for '8' is remembered by a game of pool, the cue stick (straight as an 'arrow') and the 8-ball.

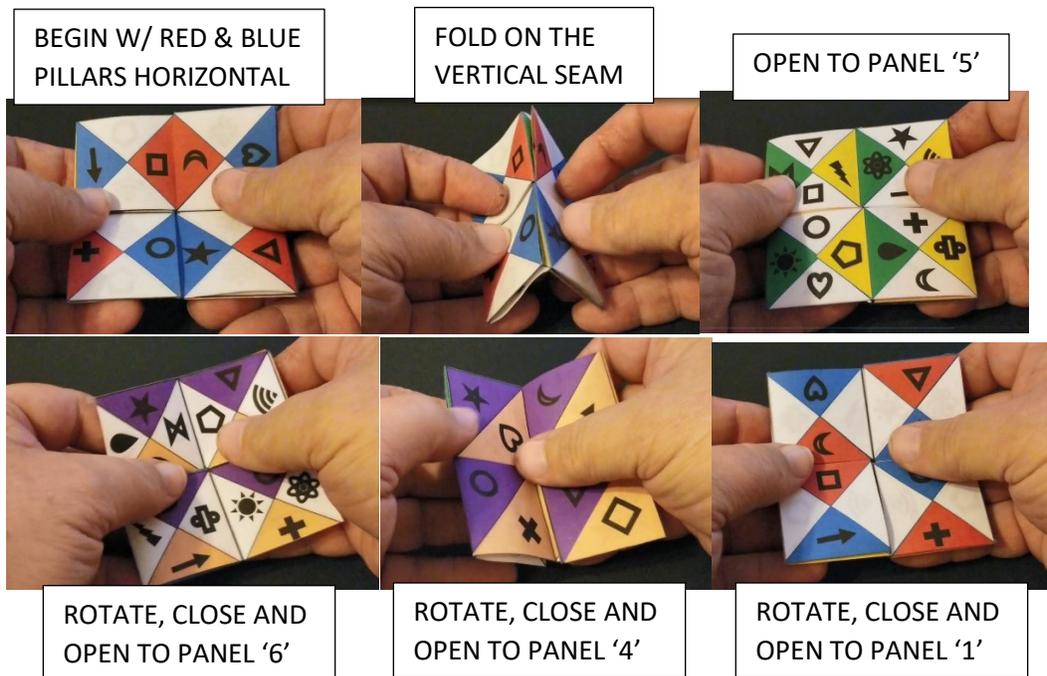
Method: Practice with the number flexagon, running through sides 1 - 2 - 3 - 4 - 1 - 2 - 3 - 4 - 1 - etc. and sides 1 - 5 - 6 - 4 - 1 - 5 - 6 - 4 - 1 - etc. Once you have it down, print out and construct the real prop, and hold it with side that has the blue and red triangles upwards. This is side '1'.

Notice also that the red and blue triangles run in 2 rows (ill. A.) If you begin the flexagon maneuver with the red / blue pillars running towards and away from you, and the first fold along the vertical center (the seam that's dividing the 2 white center diamond shapes) you'll cycle through sides 1 – 2 – 3 – 4, as illustrated below.



This circle of funness can be repeated however many times you desire.

To show the other two panels, begin with the red and blue pillars horizontally. When you do the flexagon's action you'll show sides 1 – 5 – 6 – 4 – 1 – 5 – etc, as shown below.

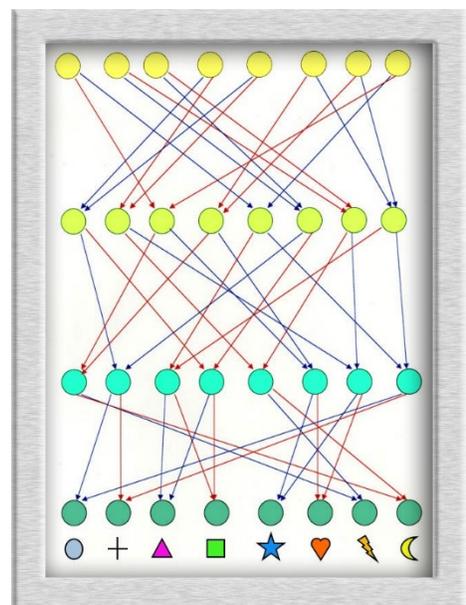


Both rotations of panel sets can be easily switched back and forth. Simply begin the sequence with the two straight lines of red & blue triangles vertical for **sequence 1** (1-2-3-4-1-2-3-...), or horizontal for **sequence 2** (1-5-6-4-1-5-6-...).

The Method:

I'm going to explain the binary sorting inner-working of this trick with my trick 'Secret Paths', shown to the right.

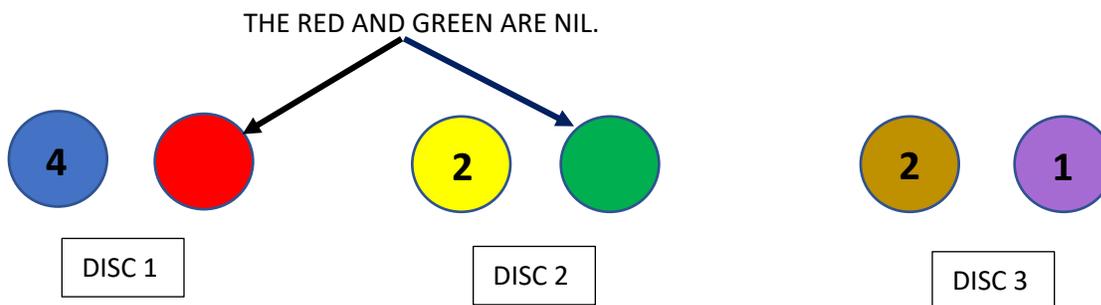
Start at the top 'yellow' row of circles. Place your finger on any one of them. Normally the spectator would have the choice of the red line or the blue one, but for example let's assume he chooses 'blue'. Follow the blue line down from your circle to the next row. Once again, the choice is given and let's suppose he says "Red". Follow the 'red' line from the circle your finger at, down to the next (3rd) row of circles. The choice is given one last time, suppose he says "Blue.". Follow the blue line from your fingered circle to the bottom row. Note the symbol that is below your circle. Concentrate, concentrate, ah I see it now, it's the 'TRIANGLE'! No big feat since the color pattern of blue – red – blue will always end on the triangle, regardless of which top circle it began. Each of the eight possible color patterns takes you to a specific symbol. Because of all the other various red and blue lines travelling different directions, it creates a strong illusion of randomness. This secret is what's



inside the flexagon. I replaced the 2nd set of red and blue with green and yellow, and the 3rd set with purple and orange. This eliminates their redundancy and makes the flexagon more colorful and frankly cooler looking. I assigned the middle set of symbols with 8 different ones. This not only make the prop more attractive it also makes the routine easier for the spectator(s) to follow.

In the 'Perplexagon' prop, panels 1 – 2 – 3 – 4 sort the same way 'Secret Paths' does. Even the first 6 symbols and their number positions are the same. I changed 7 & 8 to the moon and arrow respectively. Basically, each chosen color divides the possible ending-at symbols by half. The 8 starting possibilities become 4, then 2, then 1. The discs force the choices between the two of each pair of colors & eliminates any need for the spectator verbally choosing.

The discs and their values are given below:



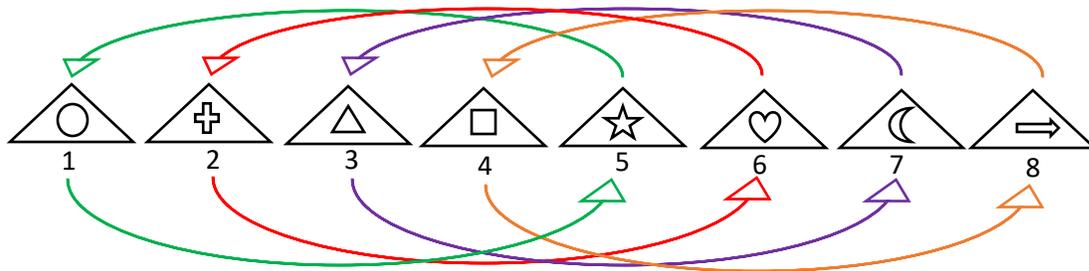
By simply adding the values of the 3 upper colors together, the total tells you which symbol the spectator will end once they've travelled through the flexagon, using those 3 colors along the way for navigation.

1. Hand the 3 discs to a spectator and have him drop them onto the table. 3 colors will land upright. Mentally add their values together which tells you which symbol he'll end on. Predict it somehow, either written on a piece of paper and handed to him to hold, or force a card in a packet, my personal choice. I use a 'glide' force. Information on this can be found online.
2. Show panel '1' and ask him to put his finger on any 'white' triangle. Now, draw attention to either red or blue (whichever's on top) and tell him to move his finger to the triangle of that color that's touching an edge (closest) of his triangle. Throughout this routine, the moved-to locations must be the one that's right next to the spot they're touching. In other words, they can't randomly pick any one of the four triangles of the color. If they did the binary sorting process would be disrupted. You could even fold the entire flexagon into 1/4ths if desired, where only the touched quadrant and only 1 color of each is visible. Whichever symbol they go to, tell them to remember it.
3. Activate the flexagon to close '1' and open panel '2'. Tell them to look for their symbol (the one they traveled to on panel '1') amongst the white triangles. When they find it, refer to the upper color of disc 2 (yellow or green) and instruct them to move from that white triangle to the nearest yellow or green triangle (determined by whichever of those colors is upwards), once again noting the symbol that's in that yellow or green triangle.

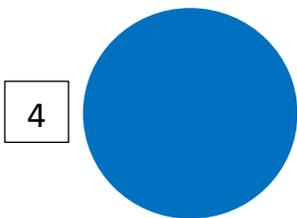
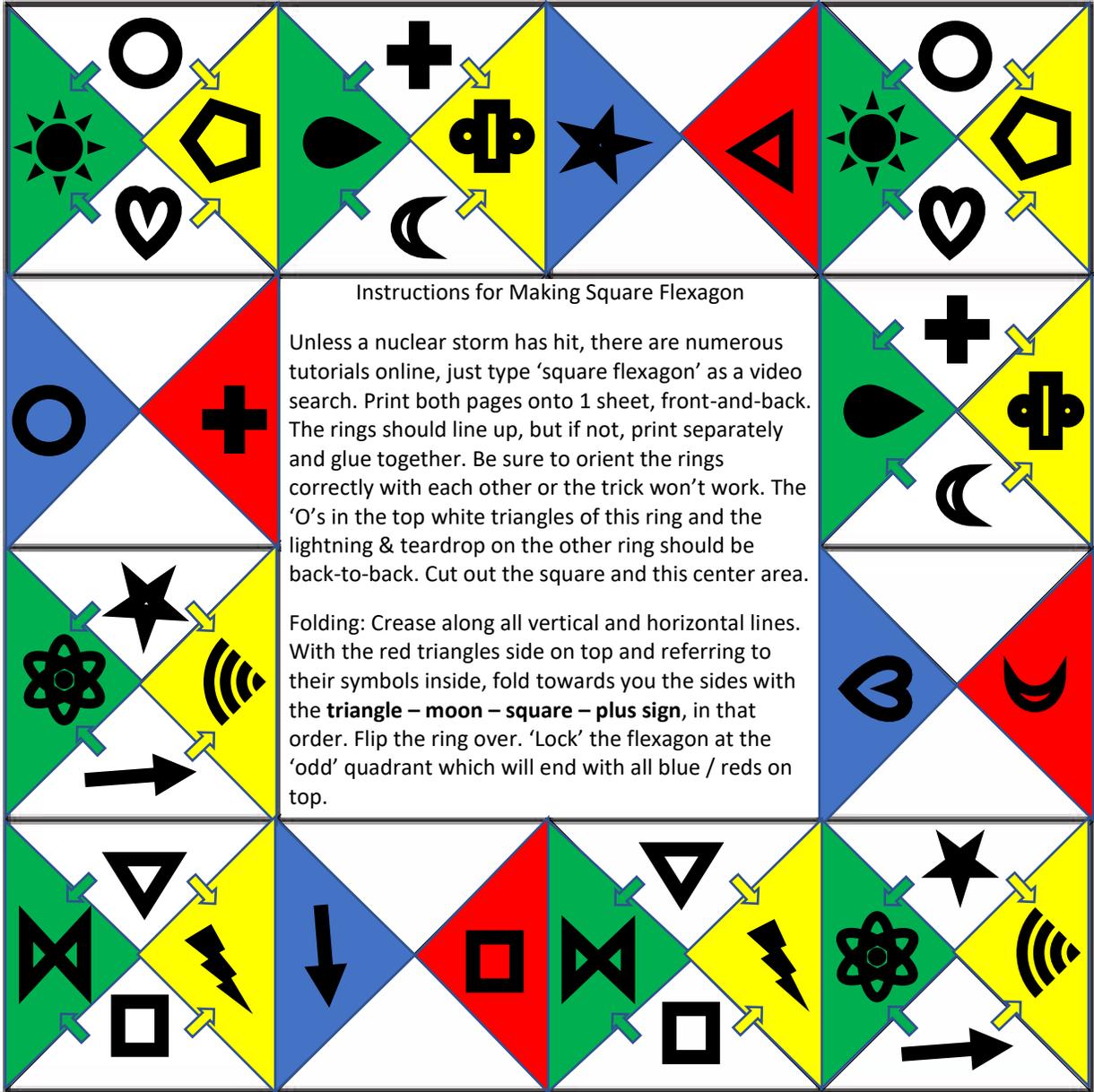
4. Activate the flexagon to close panel '2' and open '3'. Just like earlier tell them to look for their new symbol (they moved to on panel '2') in the white triangles. Once they find it, refer to the upper color on disc 3 and like earlier tell them to move from that white triangle to the nearest triangle of the same color as what's on top of the disc. Tell them to remember that final symbol. Activate the flexagon to close panel '3' and open '4'. Ask them which symbol they ended on. Remind them that they chose which place to start on and the discs' uppermost colors. These are true statements and obscure the division process that was happening by diverting their brains towards a different train of thought. Reveal your prediction in whatever means your routine uses. If it's a forced card let them turn it over for a strange coincidence they did themselves. All these endings get great responses.

Panels 5 & 6:

I've designed the sequence of panels 1 – 5 – 6 – 4 where the ending symbol is **4 numeral** positions away from that of sequence 1 – 2 – 3 – 4. In other words, if the 1-2-3-4 sequence ends on '+' (#2), the other sequence (1-5-6-4) will end on '♥' (#6). Here's their four parities:

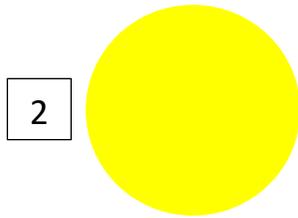


By using the 2nd sequence (1-5-6-4) you can repeat the trick to one spectator. You can even give them the option of using the same number pattern, or they can drop the discs again. If they choose to change the color combination, use sequence 1 – 2 – 3 – 4 again. If they choose to use the same colors, use the 2nd sequence 1 – 5 – 6 – 4 the second time around which will take them to a different symbol. This is the sneaky bit of the flexagon that will dispel any 'binary' suspicions because the same color sequence took them to 2 different ending symbols, uncharacteristic to binary processes. Likewise, with two spectators, use both sequences if they choose the same color pattern or just the 1st sequence if they choose to go with different color patterns.



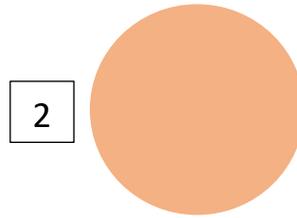
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COIN 1



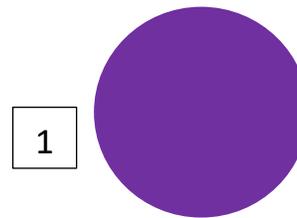
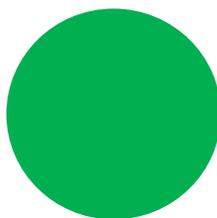
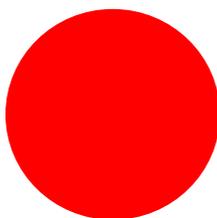
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COIN 2



2

COIN 3



1

