

CUBIC LOGIC

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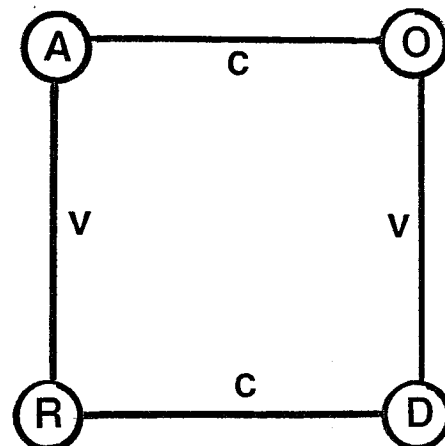
At the fourth Gathering for Gardner in Atlanta I presented an electronic depiction of a four-dimensional cube on which a magic trick could be performed. The subject was to secretly select a letter from the word ASTEROID and also secretly choose one of two quirks, either CONVIVIAL and always tell the truth or CONTRARY and always lie. After answering each of four questions according to his quirk, the device quickly identified his letter choice. The details are given in my article "Cubist Magic" p. 143 in AK Peters 2002 book *Puzzlers' Tribute, A Feast for the Mind*, edited by David Wolfe and Tom Rodgers.

After my talk Raymond Smullyan, certainly the world's leader in popularizing logic, gently chided me for using CONVIVIAL and CONTRARY as my quirks. He reminded me that mathematicians simply used instead "LIARS" and "TRUTHTELLERS" and these were preferred when talking to them. Of course, I had to agree but when talking to beginning students who have not yet studied logic I still occasionally use CONVIVIAL and CONTRARY.

In fact, I have now added the quirk CONFUSED to my list in which the subject is to alternately lie and tell the truth (starting as he chooses). I now have an electronic version on a 5-cube, again using ASTEROID.

An example using all three quirks is the effect called ROAD RAGE. The subject is to secretly choose a quirk and a letter from the word ROAD. He then is asked to respond to four questions on the RAGE diagram. Each question is of the type "Is your letter in this two-letter word?" He will mark with a coin his "yes" responses. He could instead mark his "no" responses.

R	A	G	E
AD	OR	DR	DO



The square with labels ROAD will reveal the subject's letter choice. Always start on the "O" and trace marks on a vowel (v) or a consonant (c). For example suppose the subject chooses the letter R and the quirk CONFUSED. Suppose also he decides to use the order lie, truth, lie, truth. His marks will be in order Y-Y-N-N and following from O the Y marks we trace v-c (or c-v) and land on R. Another example: Suppose the choice is O and the quirk is contrary. The responses will be Y-N-Y-N, yielding from O two c's or from O to A and back to O.

ROAD RAGE is mathematically tracing the 16 nodes of a four dimensional cube, but this need not be explained to the subject unless you want to impress him.

The next example is our RUGBY team the ASTEROIDS. The subject once again secretly chooses one of the three quirks and one letter from ASTEROIDS. The RUGBY diagram is displayed and he secretly chooses to use either the word list 1 or the word list 2 and mark on that list his yes response to the five questions "Is your letter in this four letter word?"

R	U	G	B	Y	
TOES	TEAR	DIET	TOAD	RISE	1
RAID	DIOS	SOAR	RISE	TOAD	2

This time the depiction of a 3-cube is used to determine the subject's letter choice. First we note whether the letter "Y" in RUGBY is marked. If it is marked Yes then we will follow from "A" (always) the UNMARKED letters of GRUB to reach the final choice. If the "Y" is not marked yes we follow the MARKED letters of GRUB.

Some examples. Suppose "O" is the subject's choice and he is convivial. His marks on 1 will be Y-N-N-Y-N. Since "Y" is N we follow from "A" R and B, i.e. suB-maR or Rap-duB ending on O. Another example on line 2. Suppose "R" is chosen and the quirk is confused and the responses could start with a lie. Then we lie-truth-lie-truth-lie and on line 2 this would become N-N-N-Y-Y. Since the "Y" is marked Yes we trace the three N's from "A" (in any order) i.e. the letters RUG and obtain Rap-dUb-peG landing on R.

This time we will be tracing the 32 nodes of a 5-cube.

One final example. Suppose "A" is the choice and contrary the quirk. Let line 2 be in play. The responses will be N-Y-N-Y-N. Here we trace the two Y's or U and B. From "A" we suB and then sUb giving the subject's choice.

