Dr. Dave Alciatore, PhD

*Supporting narrated video (NV) demonstrations, high-speed video (HSV) clips, technical proofs (TP), and all of my past articles can be accessed and viewed online at **billiards.colostate.edu**. The reference numbers used in the articles help you locate the resources on the website.*

Did you ever wonder why pool balls are colored the way they are, or why some manufacturers have attempted to change the color scheme? It turns out that there are logical explanations and clear reasons for the color choices. The standard pool ball color and number scheme is shown in **Diagram 1** (courtesy of Patrick Johnson). Every "solid" (balls 1-7) has a different color, and every "stripe" (balls 9-15) uses the same color as the corresponding "solid" (e.g., the 1-ball and 9-ball are both yellow). If you add 8 to any solid number, you get the corresponding stripe number of the same color. For example the yellow 9 is 8 more than the yellow 1 (9 = 1 + 8), the blue 10 is 8 more than the blue 2 (10 = 2 + 8), etc. An interesting mathematical fact about the balls of the same color is that if you add the numbers, the sums are increasing even numbers: 1+9=**10**, 2+10=**12**, 3+11=**14**, 4+12=**16**, 5+13=**18**, 6+14=**20**, 7+15=**22**.

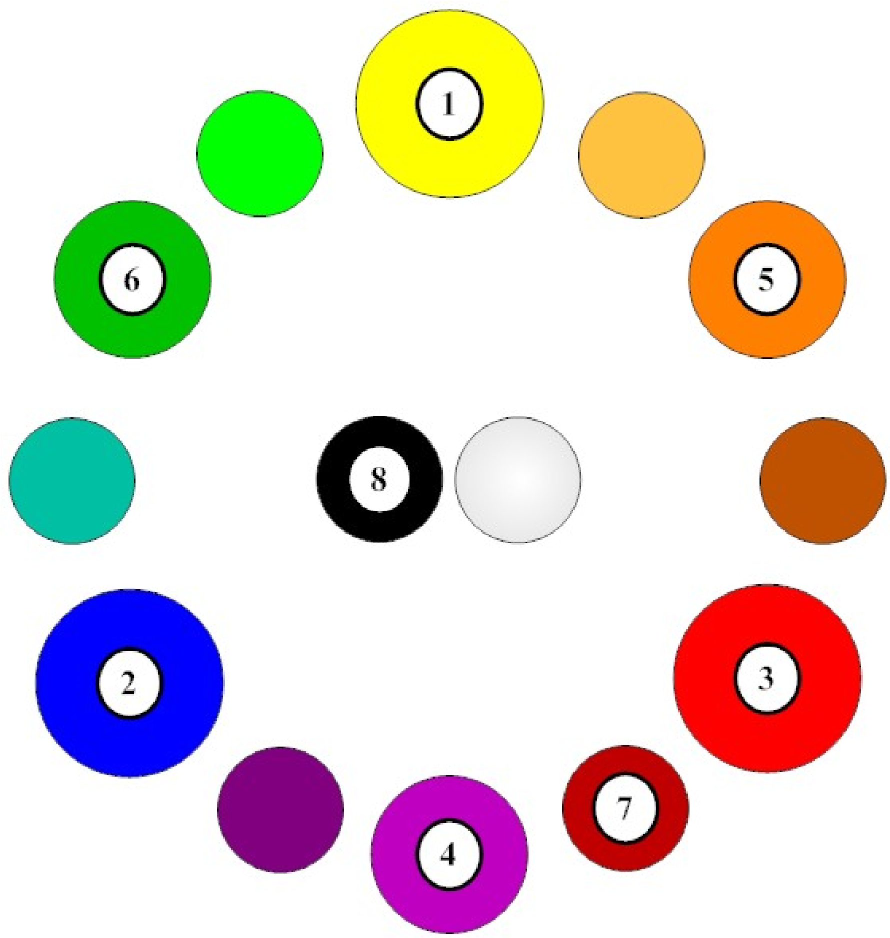

Diagram 1 Pool ball color pattern (*courtesy of Patrick Johnson*)

The choices for the ball colors were not just random. Yellow (1 and 9), blue (2 and 10) and red (3 and 11) are **primary colors**, indicated by the large-size circles in the diagram. These colors are as far apart as possible on the color "wheel," providing good contrast. Purple (4 and 12), orange (5 and 13) and green (6 and 14) are **secondary colors**, as indicated by the medium-size circles in the diagram. They are called secondary colors since they are combinations of the primary colors: purple = red + blue, orange = red +

yellow, and green = yellow + blue. They are also as far apart as possible on the color wheel. Maroon (7 and 15) is the only ball color that is not primary or secondary, hence the smaller circle size in the diagram. It is called a **tertiary color** since it is a combination of primary and secondary colors (red + purple). If there were only 6 different ball colors, they could all be equally separated on the color wheel for the best contrast. Unfortunately, pool balls need 7 colors, so the 7th was placed between two of the others, again for the best contrast. Finally, the CB and 8 ball are white (a combination of all colors) and black (no color).

In theory, the chosen ball colors provide the best contrast possible, making them easy to distinguish. Unfortunately, in the reality of TV and video pool, the contrast isn't always adequate, especially under poor lighting conditions and on a green cloth, which can be a little dark. It can help to use a brighter cloth color (for example, Simonis "Tournament Blue") and better lighting. But even then, the dark blue (2 and 10) and purple (4 and 12) can be difficult to distinguish on video. To attempt to improve this, Aramith created a "TV ball" color scheme, where purple was replaced by pink. This certainly helps some; but unfortunately, the pink doesn't have great contrast with red (3 and 11) and orange (5 and 13). The green (6 and 14) and maroon (7 and 15) are also a bit dark and can be difficult to distinguish among the blue, purple, green and black, especially on low-quality video. In an attempt to deal with this, Cyclop introduced the "skittle" colors, where light green and cyan are used for the 6/14 and 7/15. This seems to help some, but this color choice seems to create more confusion than clarity. Honestly, I am not a fan of the alternative color schemes. I like the logic and rationale of the traditional colors. And with a bright cloth color and adequate lighting (and with the numbers on the balls), the balls are fairly easy to distinguish, especially with now-common HD video.

If you arrange the balls in a full 15-ball rack in a methodical way, as shown in **Diagram 2**, all sorts of interesting numerical consistencies and patterns arise. I first learned about these patterns from the YouTube video: ***https://youtu.be/uQBeWCFsvtg***. First of all, all ball-color pairs are adjacent (yellow 1 and 9, blue 2 and 10, red 3 and 11, etc.). The solids and stripes are symmetrical (solid 2 vs. stripe 9, solid 3 vs. stripe 10, solid 4 vs. stripe 11, etc.). Solid and stripe pairs are also symmetrical (3-7 solids vs. 10-14 stripes, and 4-6 solids vs. 11-13 stripes). As shown by the added numbers in the diagram, the sum of adjacent ball numbers are symmetrical (2+10 = 9+3 = **12**, 10+4 = 3+11 = **14**, 4+12 = 11+5 = **16**, 12+6 = 5+13 = **18**, and 14+6 = 7+13 = **20**), and the sums are even numbers that increase as you work down the rack (12, 14, 16, 18, 20). The sum of side balls is also symmetric (1+2+10+4+12 = 1+9+3+11+5 = **29**).

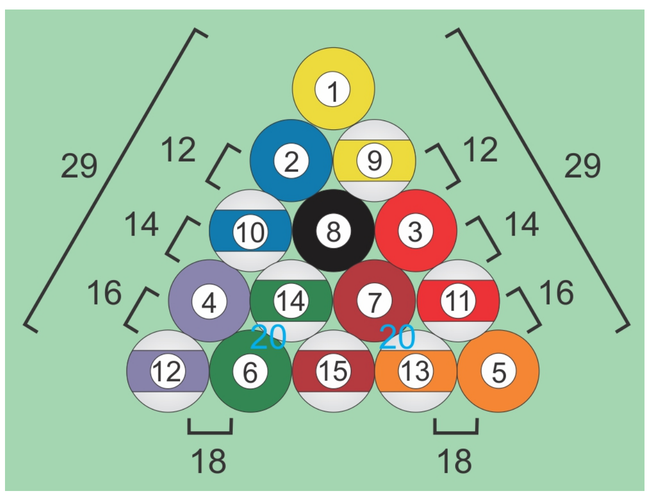

Diagram 2 Mathematical rack patterns

Diagram 3 shows some more numerical patterns in the math-magical rack. The sum of symmetrical ball pairs are odd numbers (2+9=**11**, 10+3=**13**, 4+11=**15**, 12+5=**17**, 6+13=**19**, 14+7=**21**, 8+15=**23**), and the sums increase as you work through the rack. Also, the clusters of 6 balls on each side of the rack add to the same number (2+10+4+14+12+6 = 9+3+7+11+13+5 = **48**). Pretty interesting stuff, isn't it … almost scary.

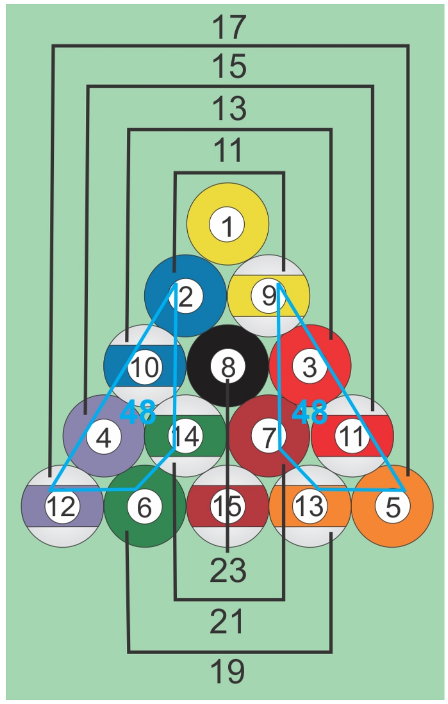

Diagram 3 More mathematical rack patterns

I bet you didn't realize how logical and mathematical pool ball colors and rack numbering can be. Wouldn't it be nice if playing pool could also be this algorithmic and simple … like color-by-number painting? Well, it isn't. If it were, pool would not be the fun and challenging game that it is. I know most pool players could probably care less about pool ball colors and number patterns, but I hope at least a few readers out there found the info a little interesting … even if it has nothing to do with actually playing pool.

Good luck with your game,
Dr. Dave

PS:

- I know other authors and I tend to use lots of terminology, and I know not all readers are totally familiar with these terms. If you ever come across a word or phrase you don't fully understand, please refer to the online glossary at ***billiards.colostate.edu***.

Dr. Dave is a PBIA Advanced Instructor and author of The Illustrated Principles of Pool and Billiards book and DVD, the Video Encyclopedias of Pool Shots (VEPS), Pool Practice (VEPP) and Eight Ball (VEEB), and the How to Aim Pool Shots (HAPS) and Billiard University (BU) instructional DVD series, all available at: ***DrDaveBilliards.com****.*