



GIVING & DECEIVING

Take a second look at these four shots that appear Impossible.

THE LONGER you study this game, the more shots you will see made that appear impossible at first glance. In my June 2007 column, I offered a bank and a cut — both of which were beyond 90 degrees for cut angle and therefore impossible according to simple physics. Of course, when the important effects are included — such as friction, which causes throw — physics says the shots are possible, depending on the conditions. Here are four more impossible, or at least improbable, shots.

The first is a bank shot that I learned from Hall of Famer Eddie Taylor, who was the acknowledged king of bank pool. It was among many shots he demonstrated for the eye-ballers at a BCA trade show. As shown in **Diagram 1**, he banked the ball by the side pocket one rail to the other side pocket. The difficulty is avoiding the kiss. You need to hit the ball nearly full to get the right bank angle, but then the cue ball will still be in the way when the object ball comes off the cushion.

A first guess on how to make the shot work would be to hit it harder. The object ball will sink farther into the cushion, allowing the cue ball to move to the side and out of the way. But with the cue ball placed as shown, no cushion has that much sponginess.

Mike Massey has another way — a jump shot. If the cue ball is airborne when it hits the object ball, it will fly up into the air, maybe getting out of the way of the banking ball. Let's just say the shot requires a level cue — that also eliminates the possibility of a masse shot to change the incoming angle of the cue ball.

In fact, the shot is easy. Just aim to

hit half the object ball on the side away from the pocket and hit it hard. The trick is the exact position of the object ball, which is with about a half-inch of the edge of the ball out into the pocket opening. From that position, a half-ball hit will drive the ball into the rubber of the rail and also into the back of the hard facing of the side pocket. The facing redirects the object ball to come straight across the table. De-

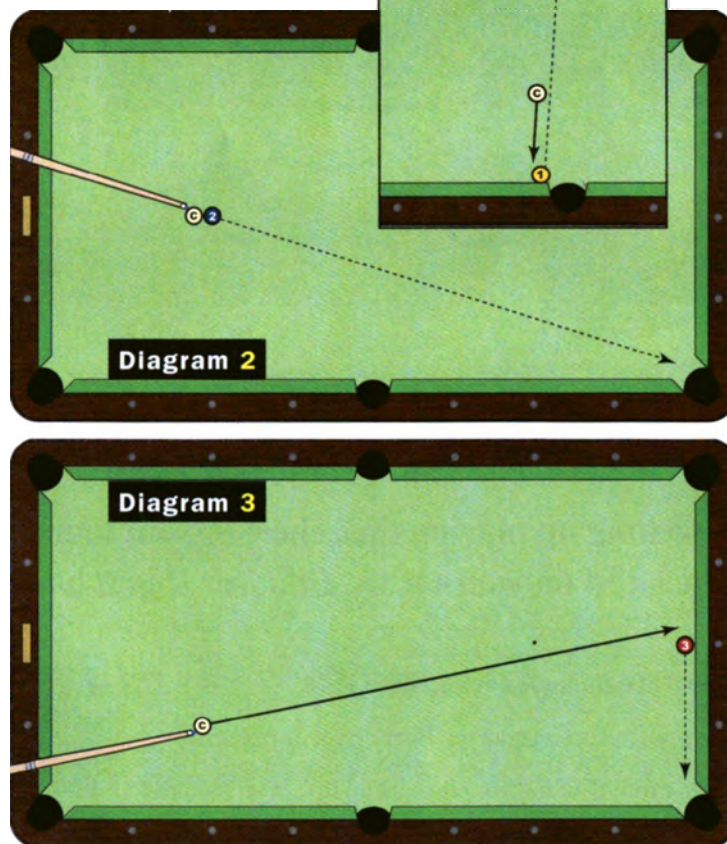
similar "impossible" bank by the corner pockets, but the facings there seem to be far less effective at redirection.

In **Diagram 2**, the cue ball and object ball are frozen together and pointed straight up the table, with the object ball on the spot. The goal is to make the object ball straight into either of the far corner pockets. I suppose you could call this the "pick your pocket" shot. To make this shot, just aim the cue stick straight at the intended pocket, use a little inside Eng-

lish to help the throw, and use moderate speed. To help the throw further, since you are going to need more than you ever would see on a normal shot, arrange for the contact point between the cue ball and object ball to be chalked. A deceptive person who is able to chalk balls undetected and is not fond of his thumbs might propose a wager on this shot. I like the shot to demonstrate why you want to keep the balls clean and what "skid" or "cling" looks like.

Diagram 3 is a fairly standard proposition shot. The object ball is frozen to the middle of the foot rail and the cue ball is on the headstring. Cut the object ball along the end cushion straight into the corner pocket. No, not the easy corner

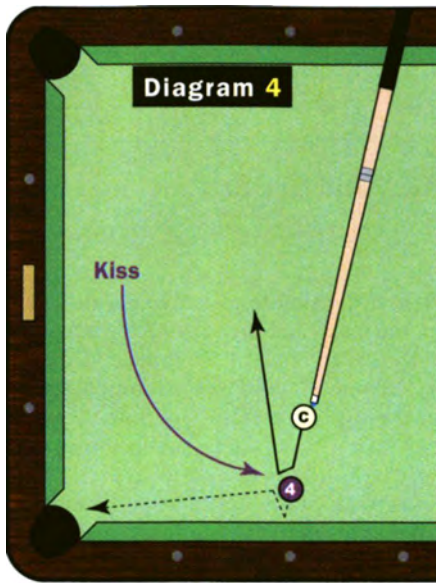
pocket, the other corner pocket. The cut angle is about 100 degrees. This shot is usually shown with the cue ball on the head spot so the cut angle is only a little over 90 degrees. Use inside English, and hit the cushion first just a millimeter from the object ball. The cue ball grabs



pending on the softness of the cushion rubber and the hardness of the facing, it's possible to overdo the shot, and bank back across on the hard side of the other side pocket. On such a table, you can move the cue ball to an even tougher location. I have tried to make a

the rail and spins over into the object ball, sending it neatly and with surprising speed into the pocket. The remarkable thing is that depending on the stickiness of the cushion and cue ball, the shot can be made from the position shown. On most tables, no special preparation is required. As a proposition, 10 tries is about right.

The shot in **Diagram 4** is one that I just learned on the Internet. A poster by the handle of "hemicudas" posted a link to a video of this shot, but in an easier form closer to the pocket. I had never seen the shot played before and thought it might require a heavy cue ball or funny cushions. I figured it was probably impossible with regular equipment, but



ball as if double banking it, but the cue ball will be in the way of the bank and will kiss the object ball. With just the right angle and speed, you can kiss the object ball back to the pocket.

After experimenting with this setup, I have a few suggestions. Mark the lo-

I was wrong. After working with it for an hour or two, I came up with the diagrammed position as a good example.

The goal is to make the object ball in the near corner pocket — for example, when playing one-pocket or when the other pocket is blocked. The method is to shoot nearly straight at the

cations of the balls, and try variations from one position before moving on to other positions. Use side spin on the cue ball on the side away from the pocket — this seems to give the object ball extra speed toward the pocket. Use follow or enough distance that the cue ball will be rolling forward when it gets to the object ball.

Pick a fullness for hitting the object ball, such as full ball. If you aim too full — toward the pocket-side of the object ball — the 4 ball won't go as far as the pocket. For such too-full hits, the 4 should be knocked back to touch the cushion a second time. If not, you need more follow or a different speed. Once you have the follow OK on a hit that's too full, try a slightly thinner hit. A hit that's too thin will get the object ball to the end rail but won't get it back to the rail and pocket. Adjust as needed. I can hardly wait for this shot to come up in a game. I wonder how many times I've overlooked it in matches.

Do you have a shot that seems impossible but isn't? Send it in, and I'll include it in a future column.



TAKE THE EASY PATH

Understand a rolling cue ball and simplify position play.

REMEMBER the first time I saw someone do weird and wonderful things with the cue ball. It was just a draw shot, but the cloth was brand new and the shooter was enjoying the wide arcs you can easily get on slippery equipment. Ever since I saw the cue ball dance like that, it seems to call out, "Yo! Juice me!" and I can barely suppress the urge to loop the cue ball or make it take impossible angles off the cushion.

I'm here to encourage you to take the safe, sane and simple path when you can. The simplest way to shoot is often to just let the cue ball roll. This takes the least effort and can give the most consistent results. An example shot is in **Diagram 1**. The cue ball is nearly on the cushion for the 4 ball and you have to get to the 5. The first thing to ask yourself is, "Where will the cue ball go if I just shoot softly and let it roll?"

I've chosen positions for the balls where the roller will work nicely. You might be more comfortable with the path of the stun shot, because you aren't sure whether the rolling ball will end up very close to the 5, such as half a diamond away. But the stun shot will take the cue ball out into the open where speed is not so critical, and you can be sure of having some reasonable shot on the 5.

In the wider context of all possible game positions, you will need to be able to play both shots well, so let's concentrate on the simpler shot for now.

First, how well can you predict the path of the cue ball if it is rolling smoothly

on the cloth? A few months ago, I gave a system you can use to find the follow angle for any cut shot. It's a little complicated to apply in general, but there are two other rules that you can use more easily.

The first system, which I showed here back in 1995, is for nearly full shots. If you cut the object ball just a little to one

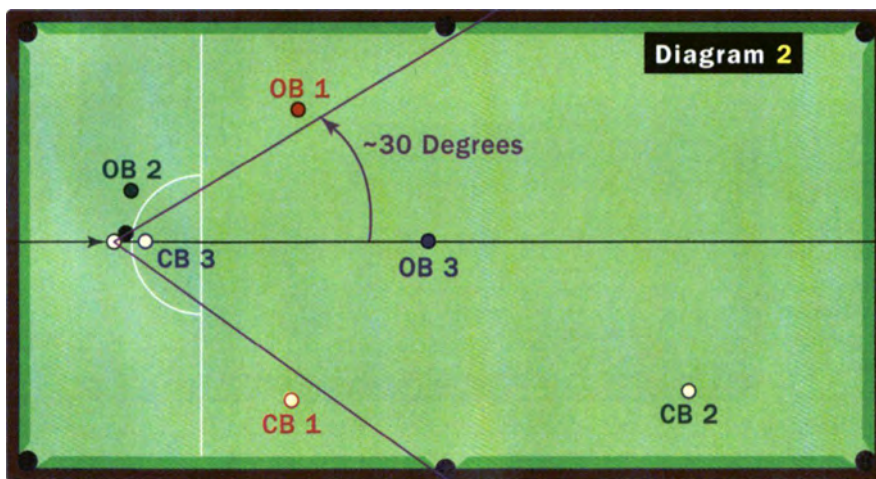
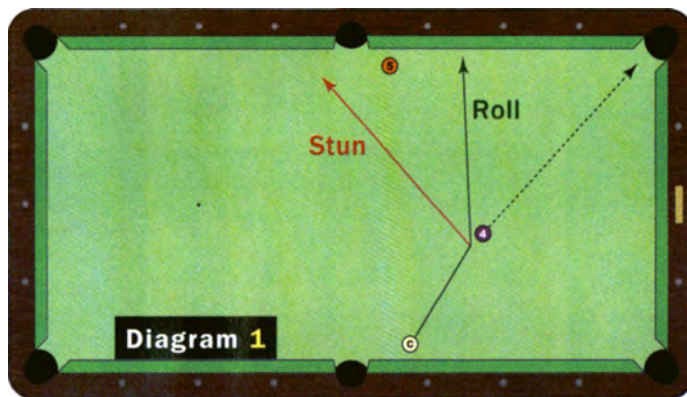
30 degrees from its original path. (There is actually plus or minus five degrees variation from that 30-degree line, depending on how close the actual cut angle is to 30 degrees, but the single angle will work for a start.)

Armed with those two systems, you should be able to predict follow angles for most practical cut shots.

A second factor to consider is how far the cue ball will roll forward after impact. In the shot shown, does it seem like the rolling cue ball can be stopped in time, or will it bounce off the cushion too far for position if the 4 ball makes it to the pocket? This is a complicated thing to learn, and there is no simple system that covers all shots, but there are two systems that simplify some shots.

For a half-ball cut shot, the cue ball will roll just about as far as the object ball does. That means if the object ball goes three diamonds to the pocket, the cue ball will go a similar distance along its 30-some-degree deflected path. Of course, if the object ball is struck

more than just hard enough to get to the pocket, the cue ball will travel a correspondingly larger distance, but this rule of thumb gives you a minimum distance that the cue ball will have to travel if you are going to make the shot. In the shot shown in **Diagram 1**, the cut angle is a little fuller than a half-ball hit, so the object ball will have more speed and the cue ball less speed due to the fullness of



side, a rolling cue ball will be deflected about three times the angle to the other side. For example, a five degree cut to the left will result in the cue ball being deflected to the right about 15 degrees.

The second system is the half-ball carom, or what Dave Alciatore calls the 30-degree rule. If the object-ball cut angle is anywhere from 15 degrees to 45 degrees, a rolling cue ball is deflected by close to

the contact. It looks like it's possible to barely make the 4 ball without the cue ball touching the side cushion.

The second rule for follow distance deals with nearly full shots. The ratio of distances traveled of the object ball to the cue ball is close to seven. That means if you drive the object ball seven diamonds ahead, the cue ball will follow through close to one diamond after it hits the object ball. (For details, see my December 2000 column.)

An important factor in all of these systems is that the cue ball must be rolling smoothly on the cloth. That's its natural state, so it's easy to achieve compared to keeping lively draw on the cue ball. Remember that if you want the cue ball to leave the tip with such smooth roll, you need to hit it almost half way from the center to the top. If the cue ball is a ways back from the object ball and you are shooting softly, you can hit lower for a surer hit and the cloth will give the cue ball full follow before it gets to the object ball.

Many people believe — incorrectly — that you can get significantly more fol-

low on the cue ball than smooth rolling will provide. There are very few situations where that's true or useful.

It is possible to calculate the rolling angle and distance of the cue ball for each cut angle. Mac Rynkiewicz of Australia, who goes by the handle of "cush-ioncrawler" on the *Billiards Digest* Cue Chalk Board, has gone one better. He has measured the final resting spots for both the cue ball and object ball (with a fixed speed on the cue ball) for a full range of cut angles. He did this using a ramp to get the cue ball up to a predetermined speed. His results are shown in **Diagram 2**. (This is a simplified representation of the original diagram from Mac, where he shows more than 40 cue ball/object ball pairs.)

Being from Australia, he had a 6-by-12-foot snooker table handy, so that's what he did his experiment on. Mac set the ramp up to roll the cue ball straight down the centerline of the table. The two balls at the intersection of the two purple lines are the cue ball and object ball for a half-ball collision. The object ball is driven off at a 30-degree angle (OB 1), while the cue ball

(CB 1) is deflected to the other side at an angle of about 35 degrees.

Note that the distances measured for the half-ball pair are roughly equal, just as predicted. For a very thin hit (CB 2 and OB 2, marked in green), the ramp has been adjusted so the cue ball travels nearly the full length of the table.

For a full hit (CB 3 and OB 3, marked in blue), the object ball travels only about half as far because, while it starts out with the full speed of the cue ball, it slows down by skidding while it begins to roll naturally. That process eats up about half its energy. Also, note that for such a full shot, the cue ball follows through about 1/7th as far as the object ball is driven.

I'm not proposing that you commit Mac's full diagram to memory, but it is useful to understand the range of position you can play with just a rolling cue ball. When in doubt about how to play position, the first thing to ask yourself is, "What happens if I just roll the object ball into the pocket with a rolling cue ball?" If the answer is favorable, go with the simple route.

SPINNING A WEB

Spider might just help remove a few bugs from your game.



HERE'S A game that combines ideas from rotation and snooker. It was invented by Carl Sandstrom, who provided the full rules below.

I think that trying a variety of games can speed your learning of all of them. New situations force you to come up with new strategies and to learn new shots. Or, you can continue to hang out at McGinty's with the same old game and the same old gang.

Briefly, Spider is played with the solids (balls 1 through 7), which are the "bug" balls, and the 8 ball, which is the "spider." You have to hit the balls in numerical order with the goal of pocketing any bug ball. Once a bug ball is pocketed, the goal changes to pocketing the spider (in any pocket) to complete the kill. The spider returns to the table on the center spot, and you go for another bug. The first player to score four kills is the winner of the rack.

Here are some strategy points:

- When on the spider, it is legal to build up the active bug inventory with caroms and combinations as long as you hit the spider first.
- If you pocket a bug ball and fail to complete the kill by pocketing the spider, your opponent will be shooting at the spider. If you leave yourself a tough shot on the spider, consider a safety.
- If the spider blocks a pocket while on bug balls, it's OK to pocket it with a carom or combination. It spots up and you continue to hunt bugs.
- Also know that you can use stripes as spider substitutes if you're impatient or trapped on a coin-op table.
- On the opening break, try to play position on the spider since it will become your object ball if you pocket any bug.
- If you have any questions, send them

in and I'll pass them on to Carl.

While Carl suggests the standard seven-ball rack for the opening break (**Diagram 1**), I propose a triangular six-ball rack with the extra ball in the back (**Diagram 2**). In my experience, it is too easy to make a ball from the seven-ball rack. Another alternative might be a standard 9-ball diamond with the two wing balls removed (**Diagram 3**).

Pool ball manufacturers should take note of the marketing possibility: a black ball with a red hour-glass shape on each side. I know just the person to promote it.

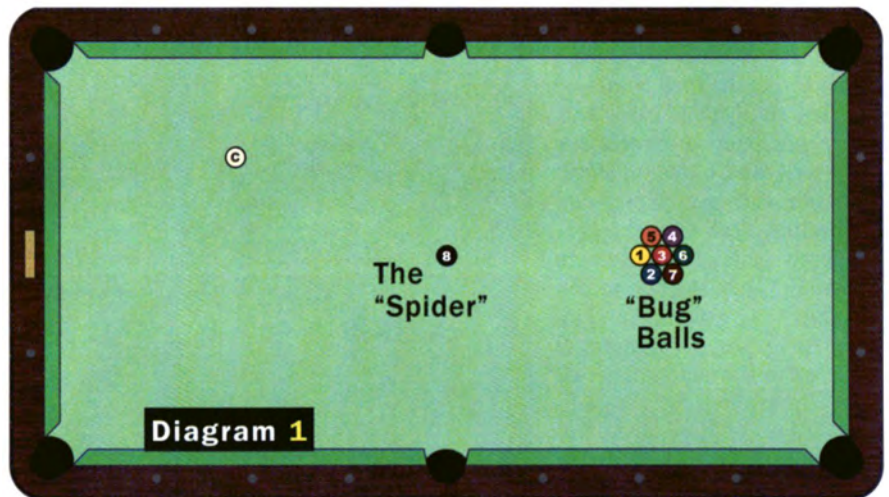
* Spider *

by Carl Sandstrom

This is a two-player pool game using 8 balls. The object is to score four kill points before your opponent. After the cue ball contacts the lowest numbered ball, any ball can be pocketed, which is similar to the game of rotation. Any legally pocketed ball that is followed by the spider ball earns a kill point.

GLOSSARY:

Web — The spider's web is all six pockets.



Prey — Bug balls caught in the web.

Victim — A dead bug after the spider pockets.

Kill — A point awarded for each dead bug (seven total).

RACK:

The 1 ball is placed on the foot spot, and the balls numbered 2 through 7 are racked randomly behind the 1. Racked balls are called bug balls. The spider (8 ball) is placed on the center spot.

BREAK:

Break from behind the headstring. The cue ball must pass by either side of the spider ball and contact the 1 ball directly. A legal break requires 2 bug balls to make contact with a rail or a ball must be pocketed. Pocketed balls accrue to the starting player, unless he scratches.

GAME PLAY:

The spider must kill any bug ball that gets caught in the web. If any bug ball is pocketed after the break, the spider becomes the object ball. If no ball falls on the break, the incoming player must contact the 1 ball. When the 1 ball is contacted, any ball that enters the web wakes the sleeping spider. After a bug ball is pocketed by either player, the spider ball becomes the object ball for both players. All pocketed balls are killed when the spider ball is pocketed. The player pocketing the spider receives one kill point for each victim. After a kill, the spider returns to the center of the table and goes back to sleep, and the next lowest numbered bug ball becomes the new object ball. Any bug ball pocketed, after a legal hit, remains in the pocket to become a victim of the spider.

SPIDER BALL:

The spider can add extra bugs to the web with combination or carom shots. If the spider is pocketed on the same shot as any legally pocketed bug ball, a kill point is awarded. Pocketing any bug ball without the spider on the table is illegal and results in a loss of turn.

SPOTTING:

The spider always returns to the table, as close to the center spot as possible. An incidentally pocketed spider spots

with no penalty, if the lowest number bug is contacted first. After the incidentally pocketed spider ball spots, with no foul committed, the same player resumes. Illegally pocketed bug balls spot on the foot spot. All legally pocketed prey balls stay down.

BALL-IN-HAND FOULS:

Failure to hit the object ball with the

cue ball results in the opponent receiving ball in hand. A spider pocketed with a scratch is ball in hand on the spotted spider. (Prey remains in the web.) If a bug ball is pocketed during a scratch, the bug ball spots and it is ball in hand on the lowest numbered bug. Ball in hand is also given for failure to either pocket a ball or make any ball contact a rail.

JUST SKIDDING

It doesn't happen often, but it's disastrous when it does.



FOR TOP players, one of the largest causes of failure to run out is a phenomenon called "skid." It can cause horrible misses or keep the cue ball from going where it should. Skid can't always be prevented, but understanding what is known about it will reduce its frequency.

Skid is also called "cling" by some. Among snooker players it is called "kick," which can be confusing to pool players who think of a "kick shot" as one in which the cue ball hits a cushion before a ball. I've heard carom players from Europe refer to the phenomenon as "bad contact," which is perhaps the clearest term for it. Whatever the name, it is usually a disaster for the shooter.

There is also some confusion because skid is also used to refer to how a ball reacts on new, slippery cloth. An example would be when a stripe is rolling directly into a newly-

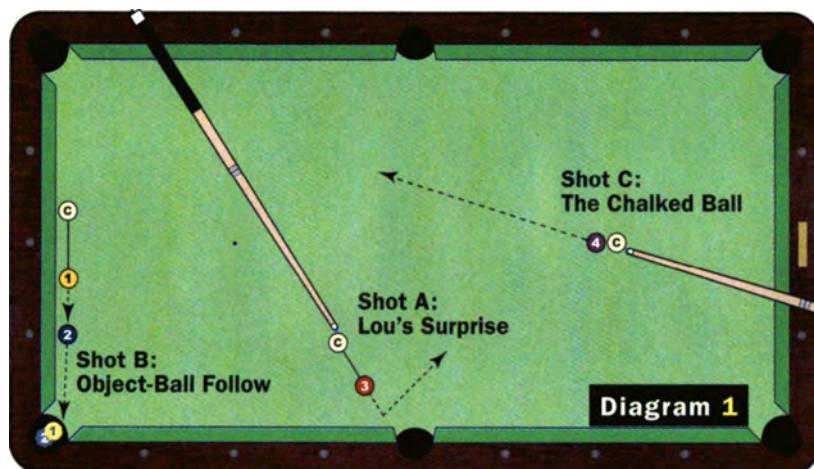
recovered cushion. After contacting the rail, it will continue to spin toward the cushion. The ball appears to slide or freeze momentarily as the spin goes to zero. That kind of skid is not what we're talking about here.

For us, skid is defined as an unexpectedly large increase in the friction between the cue ball and object ball at the instant of contact. If the cue ball's surface is moving relative to the surface of the object ball, this hyper-rubbing can have three effects. First, if there's a sideways component to the motion of the cue ball's surface across the object ball, the cut angle will change drastically. This is similar to throw, which occurs on nearly all cut shots and combinations.

A second effect of skid is to remove

spin from the cue ball. The energy required to dramatically throw the object ball has to come from somewhere, which is the spin on the cue ball.

The third effect is rarer than the first two, maybe because the player has already turned from the table in anger and frustration from the miss. Skid can transfer a lot of spin to the object ball, just as it is removed from the cue ball. In fact, if skid changes the angle of the cut, it must also put side spin on the object ball.



The main tell-tale of skid is the sound it produces. This is most noticeable on nearly-full soft follow shots. The high friction makes the front of the cue ball grab and climb up the object ball. Sometimes it's possible to see the cue ball jump up, and you often hear a thud that's probably the cue ball landing. This particular skid situation is one where the second effect — removal of spin from the cue ball — is most obvious. You are trying to gently follow forward two diamonds to get just the right angle to continue your run, but instead, the cue ball leaps into the air, lands with a dull thud and trickles two balls forward, ending the run.

The main cause of skids seems to be chalk at the contact point. If you have seen the high-speed videos of tips hit-

ting balls, you know that the tip-on-ball process is a dirty business. Great clouds of chalk fly off the tip during contact, and some of the debris remains on the cue ball. If you haven't observed blue or green spots on the cue ball during your own play, you haven't been paying attention.

The chalk has the same effect between the balls as it has between tip and ball: It prevents slipping. For the tip, that's exactly what you want, and putting a smooth coat of chalk on the

tip's surface assures that you always have plenty of friction. Between the balls, having spotty coverage of chalk leads to unexpected results.

In the December 1991 issue of *Billiards Digest*, Dr. George Onoda, an IBM researcher, analyzed the chances of skid and concluded that there was roughly one

chance in 200 that the tip-to-ball contact patch of the shot would land at the ball-to-ball contact point. He went on to analyze the trajectory of the blue patch around the cue ball during the shot, and came to the conclusion that if you use outside follow (that's left follow for a cut to the right), the tip contact patch will never end up at the impact point.

(To read Dr. Onoda's article, go to Google and put "coping with skid" as a complete phrase to search.)

Another point that Onoda makes is that the 1/200 chance and outside follow results don't hold if there is more than one chalk spot on the cue ball. Depending on conditions, you might see a dozen spots on some cue balls.

Some playing conditions seem to pro-

mote skids. At the 1980 World 14.1 Championships, skids seemed rampant. I was a referee in that event and got to see some amazing misses. Between matches and after scratches, I did my best to clean the cue ball, but some of the marks were very tenacious. Two of the most remarkable skids I saw are in **Diagram 1**.

Shot A is a simple cut to the side pocket. World champion Lou Butera missed it, and not by a little — the object ball hit no part of the pocket. He was using soft inside follow, and evidently a chalk spot jumped up, grabbed the object ball and drove it straight into the cushion.

Shot B is the most remarkable skid I've ever seen. The player was faced with two balls close to each other and both nearly frozen on the end cushion. His plan was to get nearly straight-in on the combination, draw the cue ball back a little, then play the middle ball and spin the cue ball out for position up-table.

He played position perfectly, leaving the cue ball nearly perfectly in line with the two problem balls. He also made the combo. Amazingly, the cue ball got a horrible contact on the first object ball.

This is unlikely with plain draw since the chalk patch should be cleaned off as it moves forward against the cloth, but in this case, it was persistent. The result was that middle ball picked up a lot of top spin and followed the called ball into the pocket. If you think this shot is possible under normal conditions, try it a few times. I think it's very unlikely that you will ever see the middle ball get half way to the pocket.

Because skid is so infrequent and apparently so random, it's not easy to demonstrate. Some people think skid doesn't exist at all, and is just a made up excuse for misses. Some demonstration shots for skid, or at least skid-like principles, include the chalked ball combo that I presented three columns ago (Shot C in the diagram), and the impossible cut shot and impossible bank shot that I described in my June 2007 column. The secret to making all of these shots work is to increase the friction between the cue ball and object ball by judicious placement of gritty stuff.

Some British people have come up with a theory that static electricity is somehow involved with skid. While the

forces due to static charge are probably unable to account for the quite large forces seen during kicky collisions, there might be some validity to the idea. Misplaced charges might cause chalk to cling more tightly to a clean cue ball, making a resulting bad contact far more likely.

For most players, a bizarre, unwarranted miss once every 200 shots or so is no big thing, hidden among the 100 other standard misses. As you get better, skids will be a far more frequent end to your runs, relative to clumsiness and bad aim. Some top players may reach peaks of one miss in 100 balls or better. For them, skid may dominate the causes for errors.

How can you reduce the problem? Try keeping both the object balls and the cue ball clean. You often see top 9-ball players cleaning whitey before each break. Players also may ask the referee to clean the cue ball from time to time. One other possible technique that goes against standard teaching is to use chalk only when necessary, or at least to use it sparingly. If anyone ever develops a workable chalkless tip, they'll be rich.



JUST FOR KICKS

Start with the basics when you're learning to go rail first.

YEARS AGO when pool was still on ABC's *Wide World of Sports*, Hall of Famer Joe Balsis faced a shot like the one shown in **Diagram 1**. His opponent had him trapped against the side of the rack with no good shot and no good safety. Joe's solution was to play the cue ball off the head cushion to come back and hit the "dead" combination. In an interview after the shot, he commented that the shot was fairly easy and all he had to do was hit the right ball.

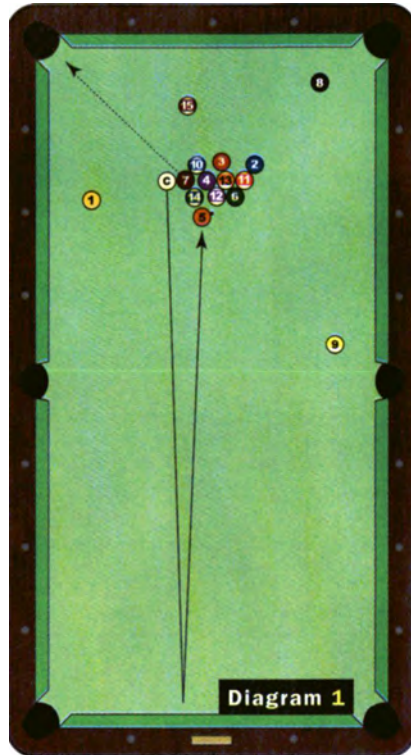
For most of us, hitting the right ball over that distance is challenging enough, but Joe did it in coat and tie and under TV lights. Below are some suggestions for practice, so you will be ready for any similar opportunity.

If you have a chance to get online, review my April 1998 column titled "Side Spin with a Kick." I covered several drills there for kicks with English, mostly as a way to gain consistent amounts of English.

Let's begin with the simplest one-rail kick — no angle and no spin.

It has been recommended as an important drill for longer than any of us has been alive, and even good players find it challenging. Shot A in **Diagram 2** is the "over the spots" drill with the cue ball starting on the head spot, passing directly over the foot spot and returning to the head spot, or the tip of your cue stick if you remain in position at the end of the stroke. If that's too hard, turn 90 degrees and shoot the ball into the side cushion. For more of a challenge, shoot harder and/or with draw. For immediate feedback, use a striped ball as the cue ball and set up the stripe to roll like a tire.

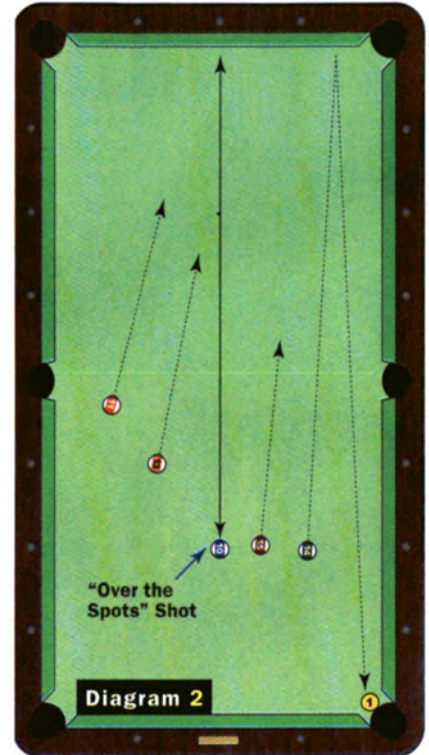
The next challenge is to add some angle. While there are several good systems to plan such shots, let's try it by rote at the start. Place a hanger in the corner pocket, and place the cue ball at the locations shown. Use a stripe for the cue ball to make sure you do not



change the angle off the cushion with intended or unintended side spin. For each position, find a target on the cushion — or a distant target if you want to sneak in a spot-on-the-wall system — that is correct for this simple kick. Once you feel you have the angles, try cranking up the speed and see if you can maintain accuracy.

Now it's time to add some English. Often the direct path to a ball will be blocked, and you have to angle the cue ball off the cushion. A large part of learning such adjustments is to consistently hit the cue ball with the amount of spin you intend.

A good way to measure how much spin you put on the cue ball is to note the angle it takes off the cushion. **Diagram 3** shows two different shots with the same quality of side spin. When discussing spin, "quality" is a special term that refers to how much spin the ball



has in relation to its speed. Cushions seem to give the same angle change for the same quality of spin almost regardless of the speed of the cue ball. (Here the effect of follow is ignored, which you can't always do in practice.)

For the two shots, the spin causes the same angle change off the cushion. In my April 1998 column, I referred to this shot as having two "units" of English, but a more common term would be "one tip of English." Dave Alciatore has discussed the pitfalls of trying to measure spin in "tips," but I think with a reference like this shot, it's well-defined and understandable even if it's not precisely related to the tip offset from the center of the cue ball as measured relative to whatever your cue tip diameter is.

Practice the shots until you can make them with reasonable consistency for your present level. You will probably

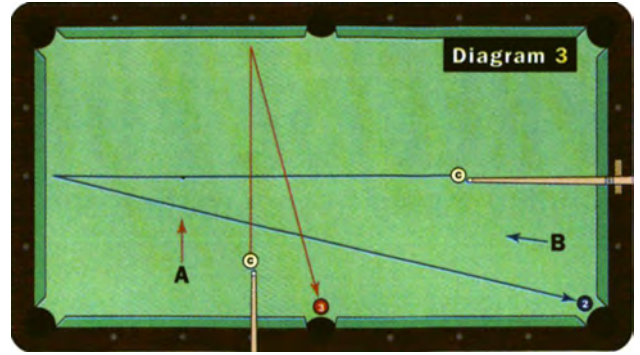
have a little more trouble with these shots than with those in Diagram 2 that were done without English. Next try a shot that requires "two tips" of side spin — from position A for the shorter shot straight off the long rail to the side pocket.

When playing kick shots at normal speeds, the cue ball will nearly always be rolling smoothly on the cloth when it gets to the cushion. This is good, because it keeps one thing constant for the shot. If most of your kick-shot practice is with a rolling cue ball, you should make sure that the rolling condition holds even for shots that aren't inherently rolling, such as with the cue ball starting near a cushion. For such shots, you have to hit the cue well above center for a smooth start. Try the short shot in Diagram 3 but with the cue ball starting a few inches from the rail.

If you do hit long shots with side spin with the tip on or below the equator of the cue ball, the quality of the side spin is effectively increased on the way to the distant cushion, as the cue ball slows down as it picks up follow while losing little of its side spin. While this tech-

nique can be used effectively for position play when you need more than a normal amount of side spin, it mostly complicates kick shots. Avoid it unless the extra spin is required.

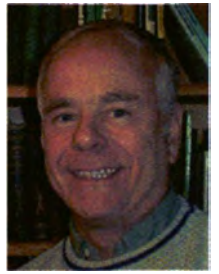
A second factor is that for slow shots, the quality of the spin can change even if you start the cue ball off correctly. On the typical worsted tournament cloths in use today, like Simonis 860, this effect is not noticeable — the cue ball seems to lose its speed and its side spin in the same proportion, so that the angle off the cushion does not depend much on the arrival speed. On thicker cloths, the side spin seems to dissipate faster than the rolling speed, so a cue ball started with plenty of side spin may arrive with nothing and produce nearly the mirror angle. Try some kick shots with "two tips" that come off the cushion just a diamond or two, and see if you can notice this effect.



Once you have your side spin for kick shots calibrated, you can use a simple system to combine angles and English. Suppose you had to shoot from position B in Diagram 3 to the middle of the far end rail to come back to the 2 ball in the corner pocket. Start by calculating where the ball would go without side spin. The simple geometry says that it will land on the end rail three diamonds from the target. If "one tip" makes a difference of two diamonds over the length of the table, then you need a tip and a half of side spin to get the right angle off the far rail. Does it work? Practice will be required.

KICK IT ONE TIME

Here's a system to use when you need to go off one rail.



LAST MONTH I had you work on one-cushion kick shots in which the cue ball had to hit a cushion before striking the object ball. This month I'll go over a basic dead-ball system that helps with such shots. "Dead ball" means that the cue ball will have no sidespin, although it will usually be rolling smoothly when it hits the cushion.

A major advantage of dead-ball kick shots is that the cue ball very nearly follows the ideal mirror path for a large range of shots. An example of this is shown in **Diagram 1**, in which you need to shoot the cue ball from the jaws of one corner pocket to hit a ball in the jaws of the other. If you shoot the shot without sidespin and just enough speed to reach the target, the correct spot to hit on the far cushion is the middle.

Where should you aim to hit the middle of the far cushion? That's not so obvious. Lots of players would note the diamond in the middle of the short rail and shoot for that. The diamond is certainly the easiest target to find, but if you freeze an object ball on the far cushion exactly even with the diamond and then sight from the cue ball, the discrepancy will be clear. For the shot shown, the difference between shooting at the diamond and shooting at a ball even with the diamond is half a ball's diameter at the far cushion. That difference, when multiplied by two — because any error grows as the cue ball comes back down the table — ends up being a whole ball in two table lengths. That has to be accounted for, one way or another.

To begin with, try the easier method of aiming, which I think is to aim at the diamond. Then try the "geometrically correct" method, which is to aim to land the cue ball even with the diamond. Which works better on your table? Be sure to try the shot from both sides, and maybe in both directions lengthwise, to ensure that stroke and table bias don't enter into the equation.

When you aim at the diamond or a spot on the rail even in line with the row of diamonds, it's called "shooting through" the

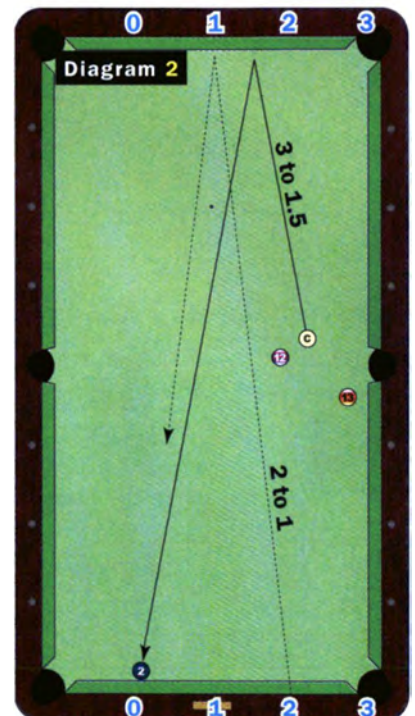
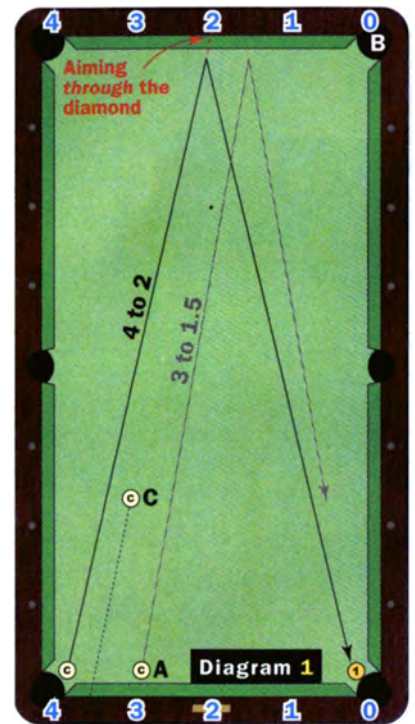
diamond. When you play to land the cue ball on the cushion as close as possible to the calculated diamond, it's called playing "opposite" the diamond.

I find that aiming through the diamond works better for me on the tables I play on. I suspect that the small inaccuracy of the target compensates for small deviations from the perfect "mirror reflection" from the cushion.

The shot on the 1 ball in **Diagram 1** is about as simple a layout as you will ever face with one-cushion kicks. To add a little complication, move the cue ball toward the object ball, but still near the cushion, say spot A, which is about three diamonds from the object ball. The target on the far rail will change some, and the "double the distance" system says that the aiming point will be half as far from pocket B as A is from the object ball, which is 1.5 diamonds (half of 3). The diamonds have been numbered for your convenience; with a little practice you should know the numbers immediately for any shot as simple as this.

With the object ball in the corner pocket, finding the target on the far cushion is pretty simple if the cue ball is near the end cushion. If the cue ball is off the rail some, such as at spot C, the job is harder. The problem is that the "origin" of the cue ball (or where your cue would cross the bottom rail) is not obvious. The cue ball is shown even with the third diamond, like position A, but it is off the short rail. One good way to find the target for the shot from C is take a rough guess and then see if the far target you've chosen causes the stick to cross the end rail in the right place according to the double-the-distance rule. The stick/rail crossing point should be twice as far from the object ball as the target is from pocket B. If you're off a little, adjust your aim and see if the new line gives the right proportion (2:1) on the end cushions.

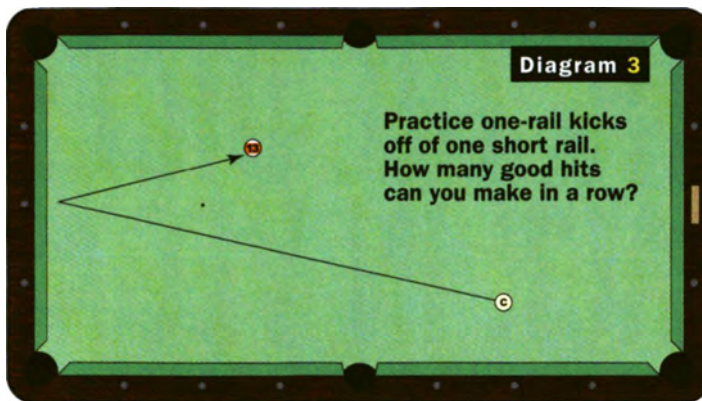
Another method to find the right line for a cue ball out in the open is to check a couple of banking lines you know by heart that surround the cue ball and take some-



thing between them. For position C, the two lines would be the 4-2 line from the first shot and the 3-1.5 line from the second shot. Since the cue ball is closer to the 4-2 line, the target on the far rail will be closer to 2 than 1.5. Again, a little fiddling should get you a perfect 2:1 ratio.

Kicking across the table (off a side cushion) uses the same arithmetic as length-wise shots, but you have to remember that there is a missing fourth diamond at the side pocket. You will also discover that the double-the-distance rule starts to break down when the cue ball approaches the cushion at a shallower angle, such as 45 degrees.

Diagram 2 shows a more complicated situation, in which you have to hit a ball that's not in the corner pocket from a position that's not near the end rail. The first thing to note is that I've re-numbered the diamonds so that 0 starts where the object ball is. The two end rails are numbered the same. The problem now becomes finding the two diamonds on opposite



ends that are in the ideal 2:1 ratio and on opposite ends of a line through the cue ball. One way to start is with a known line, such as from 2 to 1. The cue ball is to the right of that line, so pick a somewhat larger number. For the shot shown, 3-1.5 is again the correct line.

This system is unlikely to work for you unless you practice it, so here is a practice drill: Start with an object ball on the spot and the cue ball in hand behind the line. On each shot, you have to hit the object ball after one cushion. That cushion must be the end cushion that is farthest from the cue ball. See how many times in a row

you can make a good hit on the object ball. If you scratch or make the object ball, spot the ball on the head spot or foot spot to get maximum separation of the balls.

If both balls are some distance away from cushions, it is harder to apply the double-the-distance system, since you have to adjust both for the cue ball's origin and the object ball's location. An example is in **Diagram 3**. If

you can't easily apply the system, try to work it out by feel. Two techniques that may help are to work backward, using the object ball as the cue ball and finding the line to shoot it along. That will be the reverse of the cue ball's path, and will have the same contact point on the cushion. The second technique is to view the shot from the cushion you will hit, looking for a point from which the two lines to the two balls make the same angle with the cushion.

Next month I'll show a couple of systems that help with these problem shots that are hard to solve.

BY Bob Jewett



MIRROR, MIRROR

The geometry of an isosceles triangle can help with kicks.

IN MY last column, I covered some fairly simple shots in which you had to hit one cushion before the object ball. The double-the-distance (DD) system was explained for shots in which the "locations" of the balls could be found on the same cushion and the cue ball was banked off the far cushion.

Diagram 1 shows a shot that isn't covered very well by the "DD" system. The cue ball is right by a diamond, but the return path of the cue ball would go to a part of the cushion that isn't there. That is, if you extend the return line of the cue ball back to the cushion that the cue ball started from, it would return to the bottom cushion about one diamond to the right of the corner pocket. That's the location that you would need to find to use the DD system.

Now, let's look at a good way to handle shots like this. Put your cue stick out along an estimated line with the tip even with the object ball. With your tip in that position, note the spot H, which is halfway between the tip and the target. If you go straight toward the far cushion from H — along the dashed line — that is where your tip should be pointed.

If that's not where you originally pointed your stick, you need to make an adjustment to satisfy the geometry. There seems to be no easy way to calculate the required adjustment. If you can see one, please let me know and I'll spread the word. Even without a precise method, a couple of tweaks should get you pretty close. Here's a hint: If you have chosen a spot for the tip, and the H is to the left of the target spot on the far rail, you need to aim more to the left. Practice will tell you how to adjust for various ball locations.

The system works because you are constructing an isosceles triangle with the tip and the target ball on the base and the rail contact point on the vertex. One of the features of an isosceles triangle is that the angles of the two sides are equal, which is what mirror reflection is all about.

A beautiful feature of this system is that

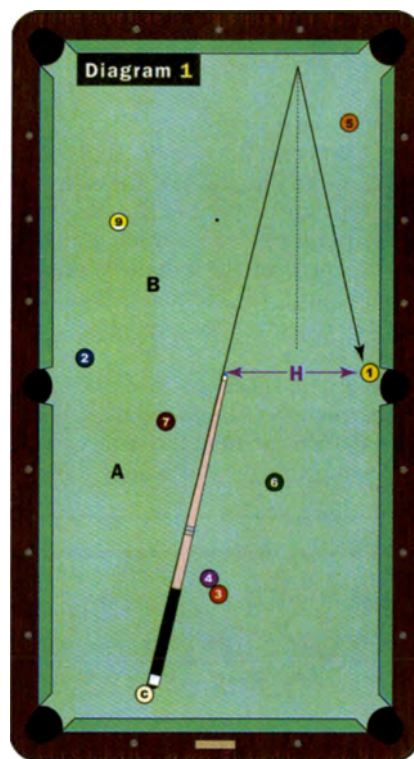
the cue ball's "origin" — that is, where the cue ball's path would cross the cushion you are shooting from — is not an issue. You could start just as well with the cue ball at spot A. You would find a different target, but you would never have to calculate where the cue ball was "coming from" as with the DD system. Also, there are no number assignments for the diamonds — you're set if you can pick the H point between the ball and your tip.

This system, which we can call the "isosceles triangle" (IT) system, works as well with one-rail kicks off the side cushions. Where it doesn't work quite as well, however, is from spots like B, for which the tip will be on your side of the cue ball and the cue stick will not be over the cue ball. It will still work, but it's a little harder to work out the corrections.

Diagram 2 shows a system for those who don't mind remembering a few numbers. As with many diamond systems, you just have to memorize these values. For those who know the "corner 5" system, the numbers along the long rail are nearly the same, except for the diamond numbered 1. The diamonds along the "origin" short rail are numbered with X, meaning that you will be multiplying by them. The target cushion's numbers go by tens.

This system is the first one described in detail in Walt Harris's "Billiard Atlas" series of books. Walt credits it to Sid Banner, who is a very good three-cushion player who has recently published his own book, "3 Cushion Billiard Systems."

First, find the spot on the long cushion you want to hit. In this case, it's 3, roughly. Next, estimate the "origin" of the cue ball. As with the DD system, that's where the cue stick will pass over the cushion you are shooting from. That will give you an X number. Multiply those two numbers together (3 and x3), you get 9. Shoot to 9 on the far cushion. This will require you to estimate a tenth of a diamond, but that's pretty close to half a ball diameter. You could aim with the left edge of the cue ball to the diamond, which would



put the center of the cue ball a half-ball to the right of the diamond.

Well, that's a pretty simple problem. Suppose, instead, that the cue ball was at position B. Now you're not sure of the origin, but a preliminary guess might give you x2. Doing the math again gives 6. You can then check your guess by seeing if the cue ball is on the line between x2 and 6 on the far rail. It isn't quite, so you have to do some fiddling.

This system is accurate enough to do more than just hit the object ball. For example, you could plan to shoot from B, hit the cushion above the ball, say at 2.5, cut 1 ball in the side, and roll down the table to about where the cue ball started (B). The origin is about x2.3 in this case, so the arithmetic would become $2.5 \times 2.3 = 5.75$, and you have to hit the cushion $2/3$ of a diamond from the corner pocket.

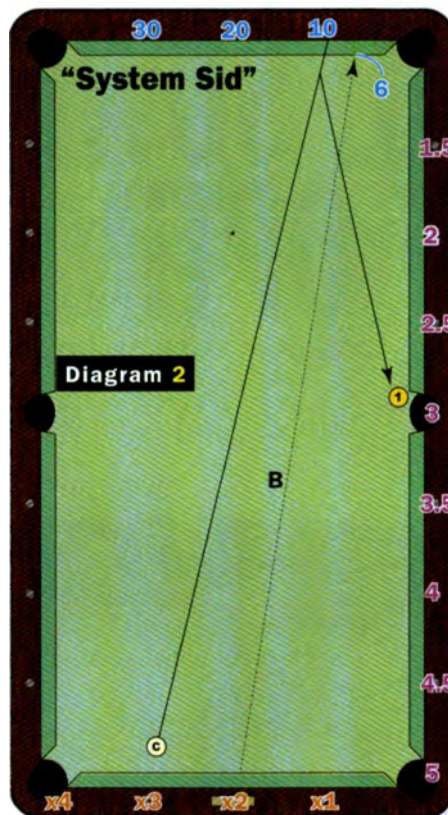
As with any system, you need to practice. While you're at it, be sure to use a variety of speeds. Also, use markers so

you can set up shots repeatably. Make sure you don't use sidespin on the cue ball — for this system and for all "dead ball" systems, that will only complicate things and make the numbers all wrong. When practicing the IT system, place markers at H and on the cushion even with H so you can see the geometry when making corrections.

If you are encouraged by your preliminary results with System Sid, and I think you will be, be warned that the numbers on the long cushion are slightly wrong. If you go through the detailed geometry, the "easy" numbers on each diamond should be replaced by the "precise" numbers as shown in the table below:

SIMPLE	PRECISE
1.0	$10/9 = 1.11$
2.0	$20/10 = 2$
2.5	$30/11 = 2.73$
3.0	$40/12 = 3.33$
3.5	$50/13 = 3.85$
4.0	$60/14 = 4.29$
4.5	$70/15 = 4.67$
5.0	$80/16 = 5$

You can probably see the progression in the fractions that determine the precise numbers for the long cushion. If you're



geometrically inclined, see if you can find where they come from.

These more accurate numbers are much harder to deal with for the multiplication, so you may want to simply note that a little correction is required for parts of the long cushion. In the case of our first shot, the 3.0 long-cushion target should be replaced by 3.33. This happens to be the worst error in the simple numbers. The multiplication by 3 would give a target on the short cushion of 10, rather than the 9 we found before. That would give roughly half a ball error in the target.

To take the system to its limit of precision, you also need to include the fact that the diamonds are set back from the nose of the cushion (the "through" versus "opposite" problem covered last month), and the fact that the cue ball is not reflected at the nose of the cushion but instead reverses course when its center is at the rail groove. Walt Harris points out that this system can also be applied when shooting off the side cushion. I'll show you next time where the numbers go, but try to figure it out for yourself— that makes it more likely you will remember the assignments.



EYING THE ANGLE

There are a few ways to find where you need to aim a kick.

IN MY last column, I went over two systems to use for one-cushion kick I shots that have the object ball positioned out in the table away from the cushion you are shooting from, such as the shot in **Diagram 1**. In the first system, with tip of your stick placed even with the object ball, you point your stick at roughly the correct spot to hit on the cushion, and then notice whether your tip, the object ball and the target on the cushion form an isosceles triangle. (An isosceles triangle has two equal angles and two equal sides, like the top of a capital letter A.)

On the Internet, Neil from Grand Rapids, Mich., pointed out a better way to form the triangle for a lot of shots. He stands by the cushion to be struck and points his stick back at the farther ball with the butt crossing the cushion at a first approximation of the contact point. With the tip advanced out as far as the nearer ball, he then checks to see if the midway point is even with the target spot on the cushion.

Neil's method is also shown in **Diagram 1**. (Both cue sticks have been moved off the line a little to show the cue ball and the line.) I think I prefer his method to mine for most shots. From that end of the table, it is easier to see both angles going out, whether they are equal and whether the spot on the cushion is half way between the closer ball and the tip. His system is more natural for shots in which the cue ball is closer to the cushion than the object ball, although my system can also work for that.

The main problem I see with Neil's way is that you need to remember the point to hit while you walk back to the other end of the table. While the diamonds can help some with this, it's not always easy to keep your spot focused down to a half inch or less, and on some shots a half inch is important.

In any case, you have another arrow for your quiver, thanks to Neil.

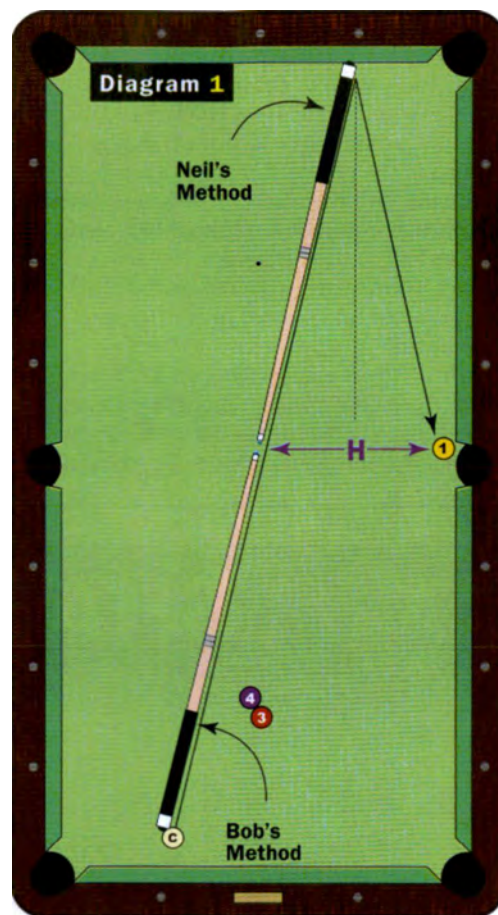
Last time I also explained 'System

Sid," which is a more formal one-cushion diamond system in which the diamonds are numbered. If you know the numbers that correlate to the locations of the cue ball and object ball, simple arithmetic tells you where to shoot. I showed the arrangement of numbers for playing off the short cushion. **Diagram 2** shows the numbers for playing the cue ball off the long cushion. This system is most directly used when the object ball is near the second cushion.

The location of the object ball is given by the numbers on the short rail. Notice that the numbering is uniform, except that the 1 is half way between the 2 and the corner pocket. The cue-ball location is given by the numbers along the long rail that your stick will be passing over. Note that they are uniform in steps of one per diamond. The numbers on the other long cushion are your target numbers, and they go in even steps of 10. That's a lot of numbers to remember, but if you work with the system for a little while, they'll seem natural — well, maybe except for that misplaced "1."

In this example, the object ball is at 3.5 — that is, it's halfway between diamond 3 and diamond 4. The cue ball is near x3. The "x" means to multiply, so all you have to do is multiply the object-ball number by the cue-ball number to find the target number. Math whizzes will immediately see that the answer is 10.5, which is half an inch from the diamond numbered 10.

If you have trouble doing multiplication with decimals in your head, you can work with approximations. For example, suppose the object ball was at 3 instead of 3.5. I hope you can multiply 3 by 3 and get 9. With a known, easy path

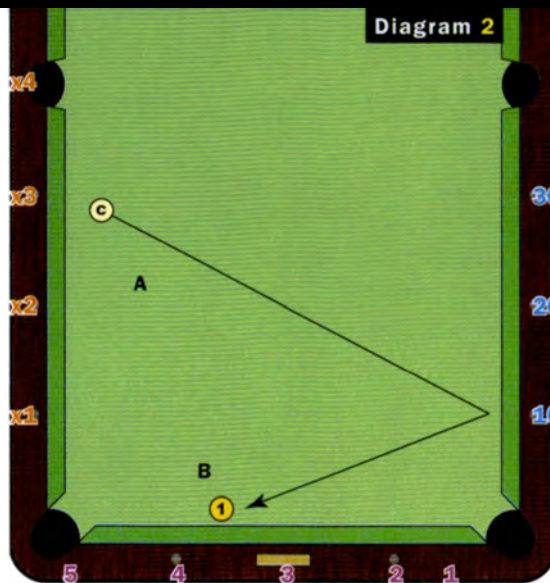


to 3 on the short rail, you can simply adjust to a point a little farther along the long rail to make the cue ball hit toward 4 from 3. Going from 3 to 3.3 would be a 10% increase, and if you increase 9 by 10% you get pretty close to 10. That will definitely be close enough to get the hit.

Neil also pointed out a different way to arrive at the same number that may work better for you. If the object ball is at 3.5, number the first diamond on the short rail 3.5, and the next diamond will be twice that (7) and the next diamond three times that (10.5). This lets you get to the number you need by just adding, and adding two digit numbers in your head is easy with just a little practice.

Let's take a slightly more complicated example and see how to do it with Neil's renumbering method. Suppose the cue ball is at A in Diagram 2. That's roughly half way between x2 and x3. Remember that those have been renumbered to 7 and 10.5. You could take the average of those two numbers by arithmetic (and get 8.75), but there is an easier way. Note the two points 7 and 10.5 on the target long rail that correspond to the two values surrounding the cue ball's position. In practice, you could put coins at those locations. Pick a spot directly between these coins, because the cue ball location is between the diamonds. In this example, you would take a spot half way between 7 and 10.5 on the long cushion, and you don't have to do any math harder than addition. You do have to be able to match proportions, though.

Just as with the "long way" System Sid, this cross-table version is not perfectly geometrically accurate because



the true numbers for each diamond don't happen to be the whole numbers shown. Also, there are minor corrections to make because the center of the cue ball never gets to the ideal reflection point at the nose of the cushion. I urge you not to worry about these details too much. Try the system and see how well it works for you. After you have calculated the target for each shot,

allow yourself to make minor adjustments if the angle doesn't feel right. Besides the rounding errors, there are lots of other factors — cushion slide, speed effects, slight side spin — that can change the cue ball's path by more than half a ball by the time it arrives at the object ball. You can't calculate all of those, so trust your experience and feel. These systems, like most systems, are a framework to organize your approach to the shot and the resulting outcomes. If you allow the framework to force the angle, and don't allow your experience to help, I think it will be very difficult

for you to use this or any system.

While you are practicing, try to build out the framework. That is, try a variety of situations. Change the speed. Take the cue ball to extremes. Extend the simple system to hits after the second cushion. For example, move the 1 ball to B and estimate where on the short cushion you have to hit to get to the 1. (It looks to be about 2.8 to me.)



PRECISION SAFETIES

With practice, you could make use of these creative shots.

HHAD the great privilege of playing in the Predator World 14.1 Straight Pool Championships at Comet Billiards in Parsippany, NJ., this past August, and the experience gave my safety game very good exercise. A part of straight pool that many haven't caught onto yet is the tremendous value of precise defense. At the top level of competition — and there were several 300-ball runners at the event — leaving your opponent even an inch of slack may also leave him a 50-ball run. Here are some safety plays that are heavily dependent upon accuracy. The more precise the shot, the more effective the safety.

Diagram 1 shows a shot from the start of a rack in straight pool. Either the player did not leave himself a very good shot on the break ball, or the player's opponent played a mediocre safe. A champion might power the 1 into the corner and come off the cushion for a break, but for many of us, that would be a low-percentage play, especially on a tight table. Rather than fall into the trap of playing the break shot, set a trap for your opponent.

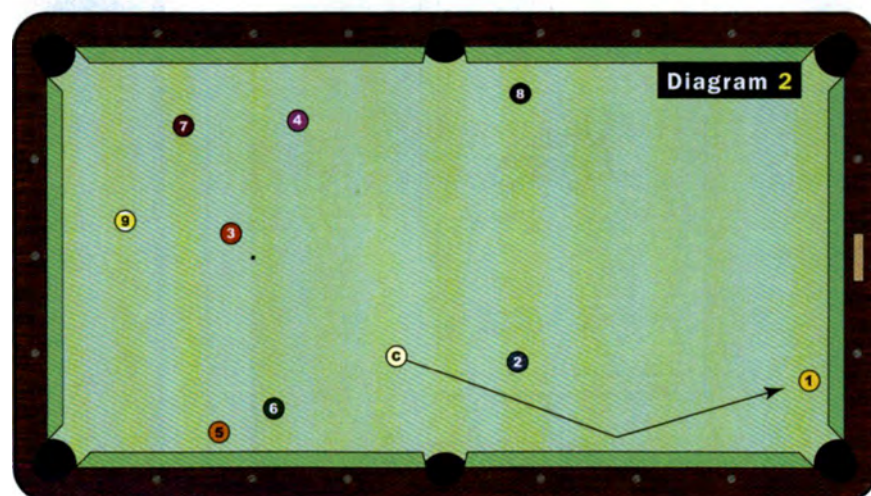
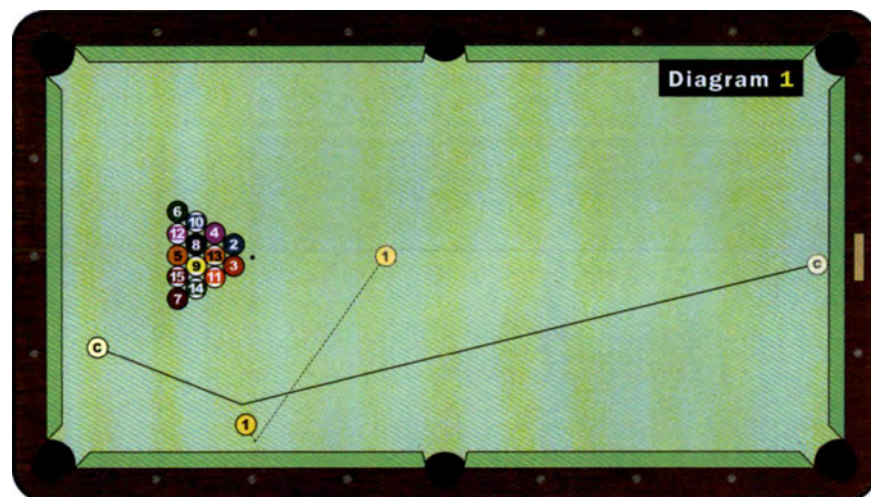
There are four main safe principles that apply to the shot shown: 1) leave as long a shot as possible, 2) make the reward for this shot as small as possible, 3) force an awkward stance and/or bridge, and 4) make the penalty for a failed response large. The goal is to leave both the object ball and the cue ball on the centerline of the table. You are also trying to freeze the cue ball to the middle of the cushion on the head rail. The object ball wants to end up close to the exact middle of the table, right between the side pockets.

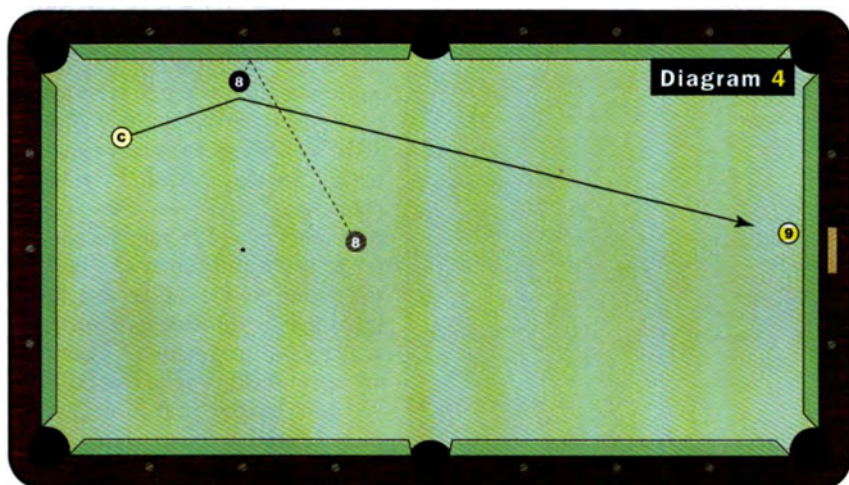
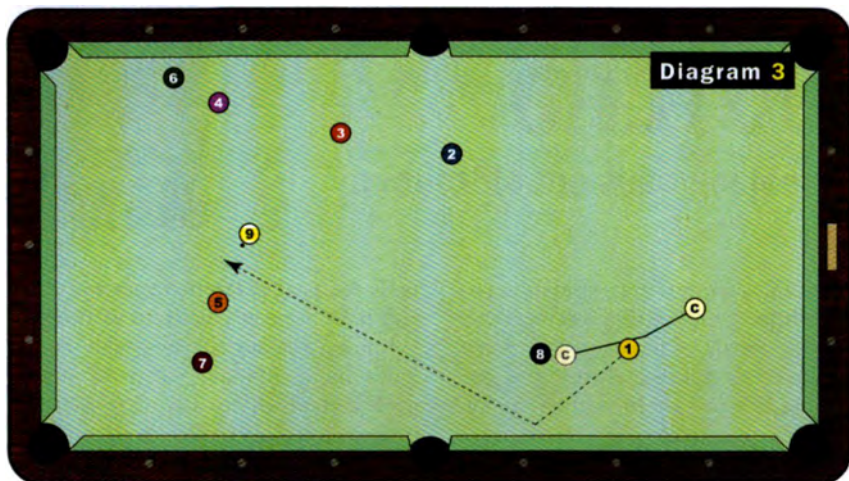
For the four principles, this is about as tough a shot you can leave due to its length. If your opponent does make the ball, he is unlikely to break up the rack. No one likes to bridge from the cush-

ion. Finally, if he makes the mistake of missing a shot that is powerful enough, the object ball has a good chance to go two cushions into the rack, and break it up even if the cue ball doesn't. If your opponent tries to slow-roll the object ball into a pocket so he can play safe on his next shot, the object ball has a good chance of hanging in the jaws, leaving you a pretty good break shot.

In **Diagram 2** is a shot that Karen Corr played in a 9-ball match. When

she played it, I initially thought that she made a mistake. But when she executed it, I thought, "Wow, it worked!" The play is to roll the cue ball with just enough speed to bump the 1 ball to the cushion, leaving the cue ball on top of 1, just a quarter-inch away from it. If you do that, your opponent has little to shoot at, since going off one side of the 1 goes into a pocket and off the other side has no easy way to get behind a ball. It also leaves the 1 ball near the





pocket. I suspect Karen learned this kind of safe at snooker, since on a 6-by-12-foot table, you often have no good shot if the cue ball is close to the object ball. Accurate speed is required, but if you never try for accuracy, you will rarely achieve it — so practice accordingly!

Diagram 3 shows a simple shot, but accuracy is essential. The game is 9-ball. The safe is to bank the 1 ball down by the 9 and leave the cue ball on the 8. As long as jump sticks are allowed, you have to squeeze the inches and millimeters out of the distance between any blocker ball and the cue ball. Practice this one until you have both the cue ball's follow angle and distance correct within an inch. If you get that right, you don't have to worry as much about where you leave the 1 ball.

Finally, **Diagram 4** adds a wrinkle

to **Diagram 1**. In a game of 9-ball, you aren't confident that you can both make the 8 and get a reasonable shot on the 9. If the 9 were half a diamond off the cushion, you could try to put the cue ball behind it, but it's almost frozen. Make as much use of the 9 as possible. Play a shot similar to **Diagram 1**, but now do your best to freeze the cue ball to the 9. This kind of safe comes up frequently in one-pocket and snooker, where it's called a "Chinese Snooker," meaning that the cue stick has to pass directly over an object ball to hit the cue ball.

There can be a lot of creativity in safety play. I hope these examples give you some tools to startle and stun your opponents. Since accuracy — both in speed and angle — makes each of these safes much more effective, you better practice them before you need them.

BY Bob Jewett



BANKING TIPS

Plan accordingly when you're going off a cushion.

RECENTLY had the pleasure of playing in the inaugural Galveston World Classic. Competing in the one-pocket division reminded me how important banking is in that game. One-pocket banks are a little different from banks in other disciplines — you want to leave the ball near your pocket if it misses. In 8-ball, that's also good, but in 9-ball a slow miss is usually a disaster.

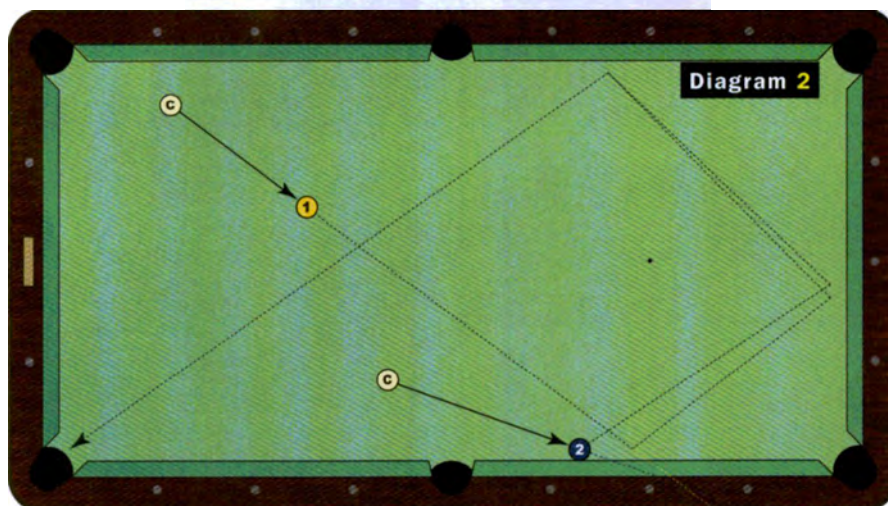
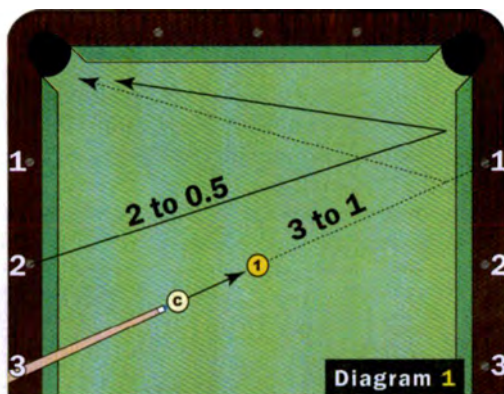
In bank pool, leaving the ball in the jaws on a miss is also not a problem, since your opponent will almost certainly have no bank on that ball, but bank players rarely play shots at pocket speed. They usually use a firmer speed that removes some of the variability of the bounce off the cushion.

In straight pool, of course, banks are quite rare. The legendary Luther Lassiter might have had three banks in a run of 80, but players like Irving Crane or Jimmy Caras would almost never resort to the cushions. A bank can often start a run from a safety battle or continue a run from a missed position or unfortunate roll.

Here are three aspects of banking that will help you get started if you are new to the game (or may be helpful reminders if you are an old hand).

Diagram 1 shows something I discovered on my own some 45 years ago, with an extension Mike Massey explained to me recently. The object ball is on the spot and the cue ball is on the line between the diamonds. The "ori-

gin" of the cue ball is 3 and the line of the shot is to **1**. By the standard mirror system, this is way off-line. The "correct" origin to land at diamond 1 and go to the pocket is diamond 2. To bank a ball off the spot, the mirror system says to shoot it toward a spot $1 \frac{1}{3}$ diamonds from the pocket, not at diamond



gin" of the cue ball is 3 and the line of the shot is to **1**. By the standard mirror system, this is way off-line. The "correct" origin to land at diamond 1 and go to the pocket is diamond 2. To bank a ball off the spot, the mirror system says to shoot it toward a spot $1 \frac{1}{3}$ diamonds from the pocket, not at diamond

1 as shown. But, if you hit the object ball full and firmly, it will bank along the line in Diagram 1. This bank shot is at the limit for a ball on the spot and serves as a rule of thumb for the "shortest" bank angle you can reasonably get. It also seems to be very consistent if you can hit the ob-

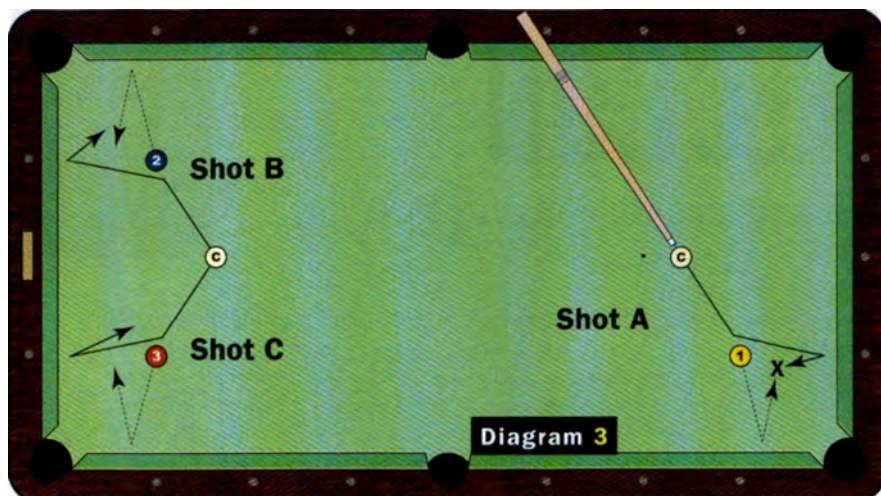
ject ball full. I find this kind of shot to be very useful for judging the cushions on a new table — some go a little long and some a little short.

Massey's addition to this single point of reference is to note that shots like the dotted line shown in Diagram 1 — from diamond 2 to diamond 0.5 — also are at the limit of how "short" you can get cross-side banks to go. The idea is if you can get the shot to match the mirror system by subtracting **1** from the cue ball's location, the bank is "on" for the system. So, if you subtract **1** from cue ball's 3 in the first shot, you get 2-to-1, which is a standard mirror bank. Similarly, for the second shot, 2-to-0.5 minus **1** becomes 1-to-0.5 and you have the 2-to-1 ratio of a mirror bank.

Can you see where you should aim from the side pocket? How far up the rails does the system hold for your table? (Remember to use a firm speed so the object ball slides rather than rolls into the cushion.)

Diagram 2 shows a simple system you can use for three-cushion banks that is especially useful if you play exclusively on one table. It is an example of the "spot-on-the-wall" system that uses targets well off the table for multi-rail banks.

Shown are two different three-cushion banks to the same corner pocket. For the 1-ball shot, the ball is a long way from the cushion, so it will pick up topspin before impact. That follow will curve the ball's path back toward



the cushion, meaning the 1 ball will rebound at a wider angle and the bank will tend to go "long." The 2 ball is on the cushion, so it will tend to come off the cushion more on the first bounce, and you have to start it along a different direction to get it to the same destination.

For both of these shots, a useful technique is to pick out a distant point. Where I often play, there is a pocket on a neighboring table that is directly along the line for the shot on the 1. That means that I can simply aim for that distant pocket — which is in my field of view — to make the bank shot. The really useful part of this technique is that if you pick a point at the correct distance, it works for a wide range of object ball positions. How far is that distance? Try a few shots along various lines from different starting positions on your own table to see what works. For each successful line, project it forward and see if all those good lines meet at one point. Remember that you are working on shots where the object ball will be rolling smoothly on the cloth when it hits the first cushion.

For the 2 ball, which is frozen on the cushion, you will need a different distant point as a target. It will be to the left of the distant target you found for the 1 ball, because the 2 will not be rolling at impact with the first cushion. The target for the 2-ball shot can also be used for balls that are nearly on the cushion, but as the distance between the object ball and cushion increases, you will need to gradually move to the target found for the 1 ball. That adjustment has to be done by feel.

In **Diagram 3** is a technique you need

to develop to avoid kisses on banks. In Shot A, the 1 ball and cue ball travel about the same distance at about the same speed and end up meeting at X. Whenever the paths of the cue ball and object ball cross on a bank shot, you need to be the traffic cop and make sure that one of them passes first. If you can't decide which ball will be first before the shot, you're probably going to have a wreck.

One technique for avoiding disaster is shown in Shot B. Using right (inside) English, you bend the path of the cue ball off the cushion so it passes "behind" the 2 ball. That is, the 2 will cross through the danger area first. In this case, you accomplish this by moving the point where the paths cross to a spot earlier on the 2's path.

The opposite spin sometimes works as well. For the 3 ball, right (outside) English changes the cue ball's path in the other direction, and the cue ball crosses the intersection first.

Depending on the exact shot, you will find one technique or the other (or maybe both) will avert disaster. You need to practice if you hope to get a feel for this technique. An important part of that practice is to try to predict on all your crossing bank shots which ball will pass first and where the potential kiss will take place.

To complicate matters, the cushions can change which kisses are deadly. Some cushions kick the ball out faster than others, changing the timing. New cloth may be so slippery that the side-spin doesn't "take" enough to bend the cue ball out of trouble. To take all of this in requires practice on various kinds of equipment.