Problem
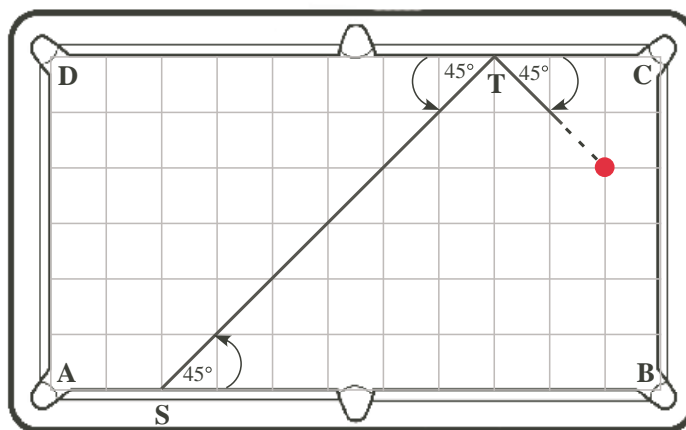
a) A pool table is 6 units by 11 units, as shown at right, with pockets only at the corners A,B,C,D. Suppose a ball is shot from S at a 45° angle, as shown, and continues to rebound at 45° each time it hits the edge of the table. Will it land in a pocket, eventually? If so, which one?

b) Mark on the diagram the position from which you would have to shoot on the table in a) in order to sink the ball in pocket C with just one rebound.

c) Suppose instead that the table is 6 units by 12 units, and S is still 2 units from A. If you shoot from the same initial position S, do you get the same result as in a)? Explain.
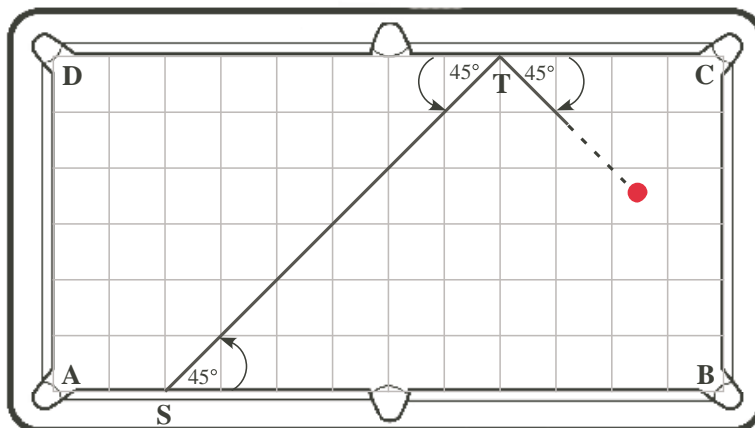
Extension:

1. Consider the set of points shown as bold dots on the edges of the 6 unit by 11 unit table from part a). Is there any starting point in the set from which you could shoot the ball with 45° rebounds so that it NEVER lands in a pocket, no matter how many times it rebounds? HINT: Trace the paths (in both directions) from starting points S_1, S_2, S_3. Explain why this reveals the outcome for every path for a ball shot from any point in the set.
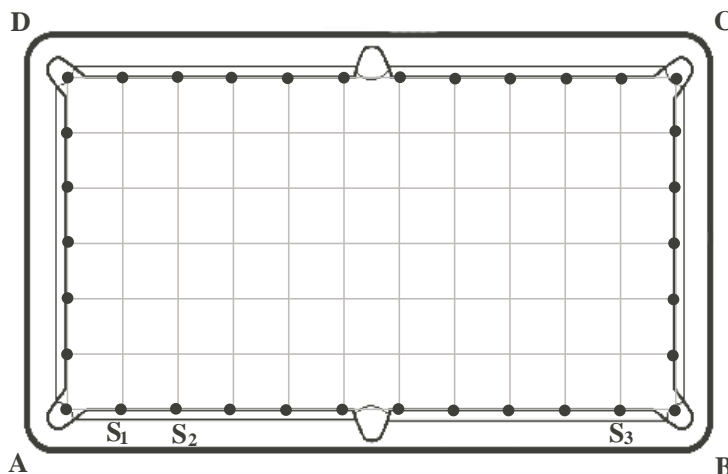
Hints

Suggestion: Make sure the drip rate is slow enough for accurate counting (say, no more than one droplet per second), but not too slow.

Solution

Solutions here will depend on the data collected by each team. If concerned about potential mess or water play, the teacher can do parts a) and b) with the class and only one dripping tap, and then have students complete parts c), d), e), and the Extension.