

Straight Shooters

Math 123

March 30 2005

1 Purpose

The purpose of this activity is to understand the way geometry influences the game of pool. We'll learn how to use our knowledge of angles to improve our pool game, and try it out on miniature pool tables.

2 Materials

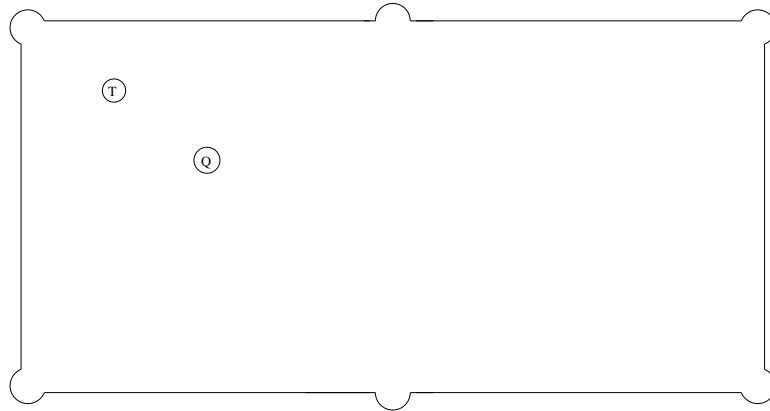
- two ping pong balls
- *mirra*
- paper
- pencil
- "pool table"
- protractor
- ruler

3 Vocabulary

- **angle**
- **clockwise**
- **line segment**
- **reflection**

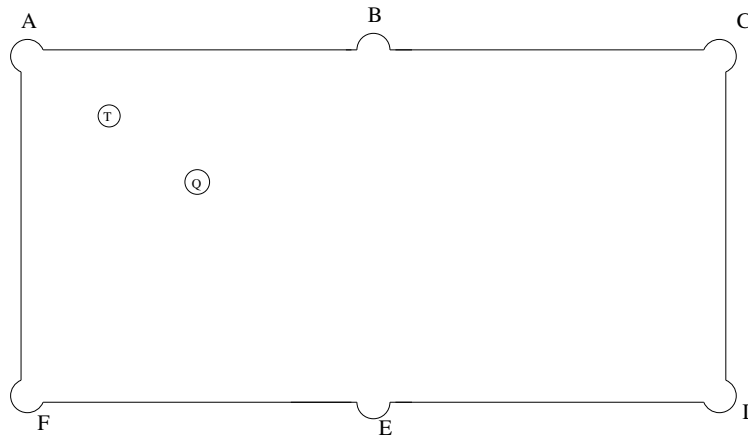
4 Easy Shot

1. The easiest situation you encounter in pool is one where you have a straight shot into a pocket, like the picture below:



In this situation, the ball marked “*Q*” is the cue ball. If you aim this ball directly at the upper left hand corner, you can see a straight line that goes right through the ball marked “*T*”, which is the targetted ball.

2. Draw a straight line from the upper left hand corner pocket through the cue ball, all the way past the edge of the pool table.
3. Label the pockets, in alphabetical order, beginning with the upper left hand pocket and traveling clockwise. (See below.)



4. Label the intersection of your line with the side of the pool table with *I*.

5. Use your protractor to find the measure of angle FAQ :

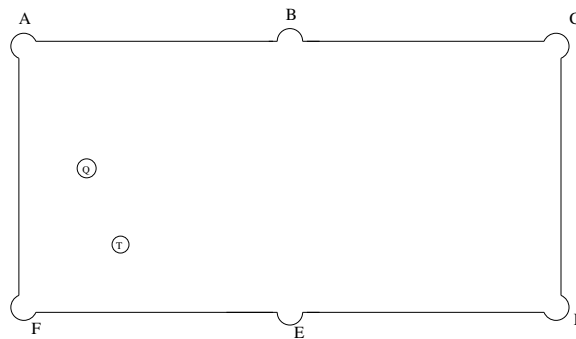
6. Without using your protractor, what is the measure of angle FIQ ?

5 Try It

1. Place one of the balls anywhere on your pool table.
2. Choose a pocket for it to go in.
3. Measure the angle formed by your ball, the pocket, and the side of the pool table.
4. Use this information to determine where to place your cue ball and put your cue ball in exactly that spot.
5. Shoot the ball (using your ruler as the cue stick) and see if it goes into the correct hole.

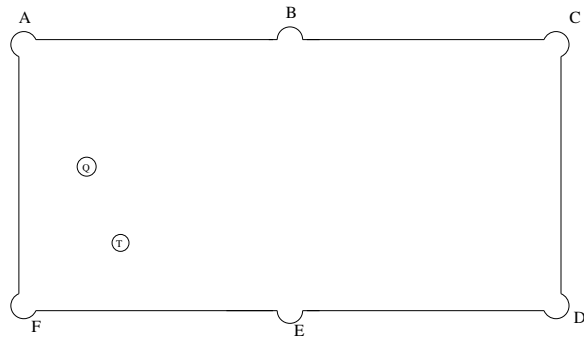
6 Reflected Shots

1. Unfortunately, in a real game of pool we don't always have a straight shot into one of the pockets, so we have to reflect the ball off of one of the sides of the pool table first. A typical situation might look like the picture below:



In this situation, your best bet would probably be to bounce the ball off the bottom side and into the central top pocket (B).

2. Draw a straight line segment between Q and the ball T . Extend this segment so that it intersects the bottom of the pool table. Label this point of intersection J .
3. Use your protractor to find the measure of angle QJF :
4. The angle you just measured (QJF) is the angle at which the ball hits the side of the table.
5. When a ball bounces off a wall, it bounces off at the same angle as it hit the wall.
6. Draw a long ray from point J to that the measure of the angle formed by your ray and the bottom side of the pool table is equal to the measure of angle QJF . Does this ray go into the pocket B ?
7. We want to figure out a way to line up our cue ball just right so that the ball bounces off the wall and goes straight into the correct pocket. We can do this using reflections!
8. On the picture on the next page, reflect the pocket B of the pool table over line segment FD . Call this new point B' .



9. Use a ruler to draw the line segment connecting the ball T and B' . Mark a point where this segment intersects the bottom side of the pool table. Label this point K .
10. Reflect the line KB' across the line FD .
11. Does this new line intersect the pocket B ? If so, it looks like you now have the correct path for the ball to follow.
12. We must check that the angle at which the ball hit the table equals the angle at which it bounced off.
13. Since we don't usually have a protractor at the pool hall, let's try to do this without using one now.
14. Without using your protractor, describe the relationship between angle TKF and angle $B'KD$:

15. What is the relationship between angle $B'KD$ and angle BKD ?

16. Using your answers from 14 and 15, what is the relationship between angle TKF and angle BKD ?

17. How can you use this information next time you are playing pool?

7 Try it Out!

1. Place a ball on your pool table, and pick a pocket that would not be a straight shot.
2. Figure out the angle with which to hit the ball using the reflections method you've learned today.
3. Use a cue ball to hit the ball in this direction, and see where it goes!