Answer on Question #48231 – Math - Algebra

1. On graph paper, draw the axes, and the lines y = 12 and x = 6. The rectangle bounded by the axes and these two lines is a pool table with pockets in the four corners. According to the laws of physics, if a ball travels along a line with slope m and strikes the side of the table, it bounces back along a line with slope –m.

a. A ball starts at (2, 6) and moves along the line with slope -2 towards the y-axis. Where does it strike the y-axis? What slope does it have after bouncing off the y-axis? Draw the paths on your graph. Give the equations for both parts of the path of the ball.

b. Follow the ball in (a) for two more bounces, drawing the lines on your graph. Give the coordinates of the points where the ball bounces off each side. State the slope of each part of the path. If the ball could move according to these rules forever, would it ever go in a pocket? (Explain)

c. If your ball is at (2, 6) and you want to put it in the pocket at (6, 0) with one bounce, at which point on the y-axis should you aim? Ex

Solution.

a. **Green lines.**
   Ball strikes the y-axis at $(0, 10)$
   Slope after bouncing: 2
   Before bouncing: $y = -2x + 10$
   After bouncing: $y = 2x + 10$

b. **Blue lines**
   Ball bounces at (6,2) and (5,0)
   Slopes: -2 and 2
   If the ball could move according to these rules forever, it never go in a pocket. It will moves between points (0,10), (1,12), (6,2) and (5,0).

c. **Red lines**

$$m = \frac{y-6}{0-2}, -m = \frac{0-y}{6-0} \rightarrow \frac{6-y}{2} = \frac{y}{6} \rightarrow y = \frac{9}{2}$$

Thus, you should aim at the point $\left(0, \frac{9}{2}\right)$.