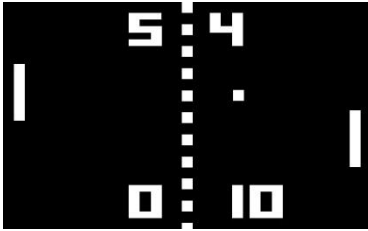# Pong

Program Description: Make a Pong game.

Part 1 – Bouncy, Bouncy

- Download the starter game & verify it runs. The starter has a ball bouncing off the bottom of the game window. Notice that in Pong, the ball maintains constant speed.
- Make the ball bounce off the inside edge of all 4 walls.
- Add the background texture.
- Use the small white square texture to add the midpoint dashed line, as shown in the image above.

Part 2 – A Real Game

- Add 2 paddle textures to your project & draw them to starting positions centered vertically.
- Add keyboard control for the paddles. Control the left paddle with the *W-S* keys and the right paddle with the *Up-Down* arrow keys.
- Use collision detection between the ball and paddles to make the ball bounce off the paddles as well as the sides of the game.
- Beware the dreaded "stuck shaky ball" – the ball should not "stick" to the paddles.
- If the ball reaches a side wall, the opposing player gets a point.
- After a point is scored, spawn a new ball in the middle
  - Give the ball random velocity values for x and y (between +/- max speed)
  - Max speed should never be so high that a good player can't intercept the ball.
- Add scoring to the game.
  - The scores at the bottom of the screen are the current game.
  - The top scores are for number of games won.
  - The score colors should match the player paddle colors
  - The first player to reach 11 points wins the game, but they must be at least 2 points ahead.
    - The game doesn't end with a score of 11-10.
    - If a player reaches 11 points, but isn't ahead by at least 2, play continues until *either* player is ahead by 2 points

Part 3 – A Bit of English

- Add a random amount of *spin* to the ball when it's spawned.
  - Spin speed should be between +/- max *spin* (max 3 rotations/second)
  - Negative *spin* is CCW, positive *spin* is CW
  - Since these are random values, the spin speed could be zero.
- Modify the ball drawing instruction to show rotation specified by the *spin*.
- A spinning ball has straight flight; spin only affects the bounce action.

- o A faster spin in the direction of bounce means a "flatter" bounce.
- o Spin opposite the direction of travel means a bounce closer to vertical.

Bounce with no spin

Bounce with CCW spin

Bounce with CW spin
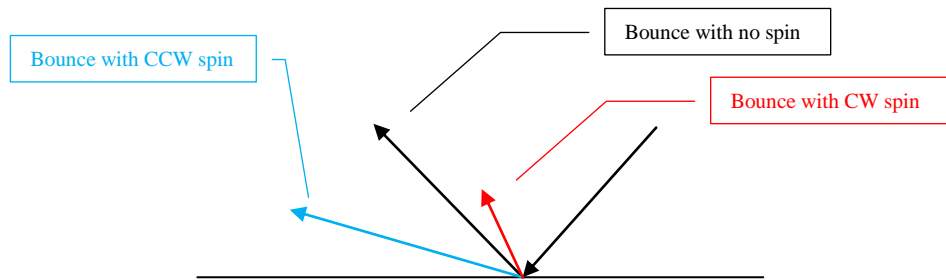
- Notice that spin only affects the non-reversing component of velocity.
    - o In the diagram above, the ball is bouncing off the bottom, so the y velocity is reversed.
    - o Without spin, the x velocity would be unchanged.
    - o To account for spin "English", add *spin* to x.
        - ▪ CCW *spin* is negative, so would decrease the x position faster
        - ▪ CW *spin* is positive, so would increase the x position faster
- Decrease non-zero *spin* after each bounce
- Spin should also affect the bounce off the paddles
- For this assignment, spin created by the paddle hitting the ball isn't required