

Homework 4  
CS Fundamentals: Calculator Review [due Tuesday]  
July 15, 2017

## 1 Review: Pong Game [Expected Duration: 15 - 20 min]

If you have any questions about the directions or any blocks you have not used before, let me know via email or text!

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In the last lesson, we built together a very cool pong game together. We built this cool calculator by using many things we learned previously and MATH. For homework, I want you to do some math with angles. Math is quite important in programming! Have fun!

I want you to use the **word** bank below to complete this assignment. Note that **the words in the word bank is used exactly once... all words are used.**

If you have any questions, **please** let me know!

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### Instructions/Notes:

$0^\circ = 360^\circ = -360^\circ$  is Up.

$90^\circ = -270^\circ$  is East.

$-90^\circ = 270^\circ$  is West.

$180^\circ = -180^\circ$  is South.

This homework is hard! You will need to know how to do reflection over x and y-axis. Do as best as you can! It is okay to not finish. Looking at the code for the pong game can help!

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### 1. Bouncing off of the top wall

The only walls the ball in pong can bounce off of are the ones on the bottom and at the top. Drawing pictures may help solve the problems below.

- a. Let's say a ball was approaching the top wall at a  $-45^\circ$  (NorthWest) angle. To simulate bouncing off of the wall, we send the ball going at a  $-135^\circ$  (SouthWest) angle. Was this a reflection over the x-axis or the y-axis (think 2D coordinate! if you don't know what this means, email me!)? [over the x-axis]
  
- b. If the ball was approaching the top wall at a  $50^\circ$  angle, what direction (degree) should the ball be traveling once the ball bounces? (Think reflection.) [130°]

- c. Generally, if the ball was approaching the top wall at a  $x^\circ$  angle, what direction  $y^\circ$  should the ball be traveling once the ball bounces? Write an equation for  $y$  in terms of  $x$ . (note: this is hard! try your best! the code can help!) [ $y = -x + 180$ ]

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1. **Bouncing off of the bottom wall**

The only walls the ball in pong can bounce off of are the ones on the bottom and at the top. Drawing pictures may help solve the problems below.

- a. Let's say a ball was approaching the bottom wall at a  $135^\circ$  (Southeast) angle. To simulate bouncing off of the wall, we send the ball going at a  $45^\circ$  (Northeast) angle. Was this a reflection over the x-axis or the y-axis (think 2D coordinate! if you don't know what this means, email me!)? [over the x-axis]
- b. If the ball was approaching the bottom wall at a  $-100^\circ$  angle, what direction (degree) should the ball be traveling once the ball bounces? (Think reflection.) [ $-80^\circ$ ]
- c. Generally, if the ball was approaching the bottom wall at a  $x^\circ$  angle, what direction  $y^\circ$  should the ball be traveling once the ball bounces? Write an equation for  $y$  in terms of  $x$ . (note: this is hard! try your best! the code can help!) [ $y = -x + 180$ ]

1. **Bouncing off of the right player's paddle**

There are 2 players in pongs. Each has a paddle. The balls can bounce off these paddles. Drawing pictures may help solve the problems below.

- a. Let's say a ball was approaching the right player's paddle at a  $135^\circ$  (Southeast) angle. To simulate bouncing off of the paddle, we send the ball going at a  $-135^\circ$  (Southwest) angle. Was this a reflection over the x-axis or the y-axis (think 2D coordinate! if you don't know what this means, email me!)? [over the y-axis]
  
- b. If the ball was approaching the right player's paddle at a  $100^\circ$  angle, what direction (degree) should the ball be traveling once the ball bounces? (Think reflection again.) [ $-100^\circ$ ]
  
- c. Generally, if the ball was approaching the right player's paddle at a  $x^\circ$  angle, what direction  $y^\circ$  should the ball be traveling once the ball bounces? Write an equation for  $y$  in terms of  $x$ . (note: this is hard! try your best! the code can help!) [ $y = -x$ ]

1. **Bouncing off of the left player's paddle**

There are 2 players in pongs. Each has a paddle. The balls can bounce off these paddles. Drawing pictures may help solve the problems below.

- a. Let's say a ball was approaching the left player's paddle at a  $-45^\circ$  (NorthWest) angle. To simulate bouncing off of the paddle, we send the ball going at a  $45^\circ$  (NorthEast) angle. Was this a reflection over the x-axis or the y-axis (think 2D coordinate! if you don't know what this means, email me!)? [over the y-axis]
  
- b. If the ball was approaching the right player's paddle at a  $120^\circ$  angle, what direction (degree) should the ball be traveling once the ball bounces? (Think reflection again.) [ $-120^\circ$ ]
  
- c. Generally, if the ball was approaching the right player's paddle at a  $x^\circ$  angle, what direction  $y^\circ$  should the ball be traveling once the ball bounces? Write an equation for  $y$  in terms of  $x$ . (note: this is hard! try your best! the code can help!) [ $y = -x$ ]