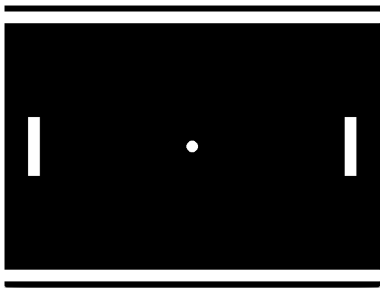
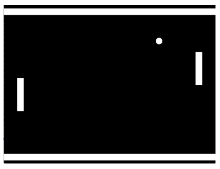
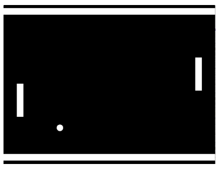
Game Programming: Exercise 5: Pong - Math exercise (2 pages)

Learning objectives	• Using the library GLM to solve problems using vectors and matrices • Implementing a matrix, which transforms an object from a local coordinate system to a global (aka. world) coordinate system. Note: When starting the exercise you only see an empty black screen! Final game: http://www.itu.dk/~mnob/pong/Pong.html
Exercise 5.1	**Implement transform** • The application starts with a black screen, you need to apply the transformations so that the objects are visible to the virtual camera. • Implement Box::getTransform() and Ball::getTransform(). Both methods should create a matrix which transform from the object coordinate frame to the world coordinate frame using translate (position) and scale. • Note that scale.z must be fixed to 0.1f • When implemented correctly the following level should appear: 
Exercise 5.2 	**Move paddles and ball** • Implement Pong::movePaddle(paddle, yDelta), where the position of the paddle is moved yDelta. Use glm::clamp to ensure that the paddle does not penetrate the top and bottom bars. • Implement Ball::move(), which should change the ball position based on velocity and delta time.

Exercise 5.3 	**Implement physics** • Collisions o To simulate physics, you need to test if the ball (a circle) collides with an edge (line segment) by implementing the Pong::hasCollision(Edge2D edge). ▪ Hint: you can use glm::closestPointOnLine() o Handle collisions by implementing the missing code in Point::handleCollision(Box* paddle). If the angle between the edge normal and the ball's velocity is less than 90 degrees, then assume no collision (this solves problems where the ball gets stuck in boundary). ▪ Hint: What vector operation help you find the angle between two vectors? • Out of bounds o Implement Pong::handleOutOfBounds(): if ball move out of screen increase the score of the other player and relaunch the ball using resetBall(bool)
Exercise 5.4	Breakout challenge (Extra - just for fun) • You are probably tired of making pong games, so modify the code to make a breakout game!