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CS 106A

Handout #21
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Bouncing Ball Example

Based on a handout by Patrick Young.

```
/*
 * File: BouncingBall.java
 * -----------------------
 * This program graphically simulates a bouncing ball.
 */

import acm.program.*;
import acm.graphics.*;

public class BouncingBall extends GraphicsProgram {

   /** Size (diameter) of the ball */
   private static final int DIAM_BALL = 30;

   /** Amount Y velocity is increased each cycle as a
    * result of gravity */
   private static final double GRAVITY = 3;

   /** Animation delay or pause time between ball moves */
   private static final int DELAY = 50;

   /** Initial X and Y location of ball */
   private static final double X_START = DIAM_BALL / 2;
   private static final double Y_START = 100;

   /** X Velocity */
   private static final double X_VEL = 5;

   /** Amount Y Velocity is reduced when it bounces */
   private static final double BOUNCE_REDUCE = 0.9;

   /** Starting X and Y Velocties */
   private double xVel = X_VEL;
   private double yVel = 0.0;

   /* private instance variable */
   private GOval ball;


   public void run() {
      setup();
      waitForClick();

      // Simulation ends when ball goes off right hand end of screen
      while (ball.getX() < getWidth()) {
         moveBall();
         checkForCollision();
         pause(DELAY);
      }
   }
```

```
   /** Create and place ball. */
   private void setup() {
      ball = new GOval(X_START, Y_START, DIAM_BALL, DIAM_BALL);
      ball.setFilled(true);
      add(ball);
   }


   /** Update and move ball */
   private void moveBall() {
      // increase yVelocity due to gravity on each cycle
      yVel += GRAVITY;
      ball.move(xVel, yVel);
   }


   /** Determine if collision with floor, update velocities
    * and location as appropriate. */
   private void checkForCollision() {
      // determine if ball has dropped below the floor
      if (ball.getY() > getHeight() - DIAM_BALL) {

         // change ball's Y velocity to now bounce upwards
         yVel = -yVel * BOUNCE_REDUCE;

         // assume bounce will move ball an amount above the
         // floor equal to the amount it would have dropped
         // below the floor.
         double diff = ball.getY() - (getHeight() - DIAM_BALL);
         ball.move(0, -2 * diff);
      }
   }

}
```