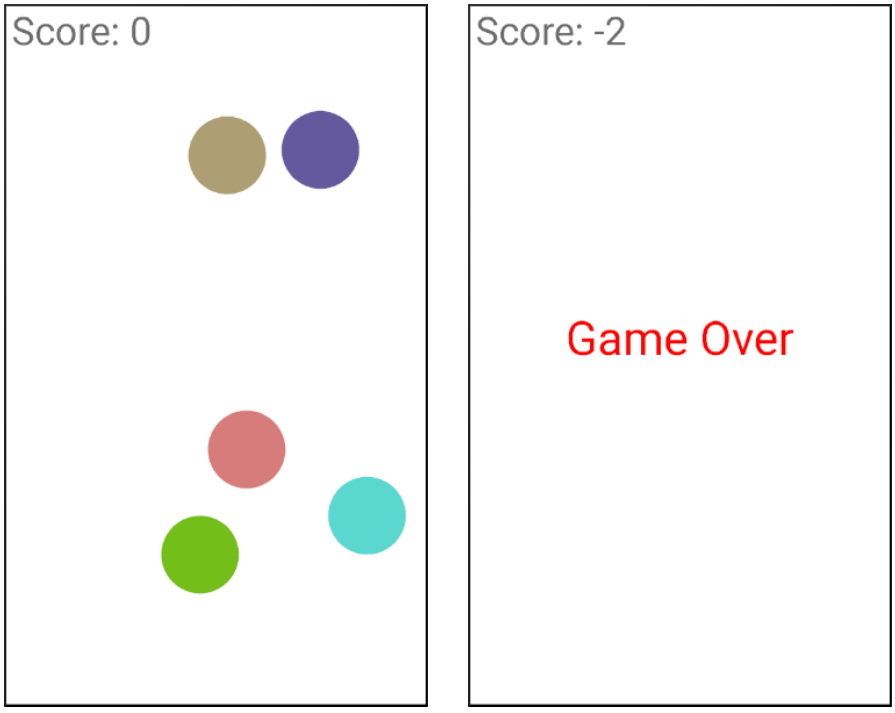
Bubble Pop
Android Development
10 points

Modify your Bouncing Ball app into a Bubble Pop app where the app displays 5 bouncing balls that the user must tap to pop. The score should be displayed in the upper-left corner of the screen. When a bubble is popped, the user earns 1 point. If the user taps and misses a bubble, 2 points are deducted, and an extra bubble appears. When all the bubbles are popped, the game is over. Tapping when the game is over starts a new game with 5 bubbles.



Finally, add a twist to the game. Some ideas:

- Make each bubble have a different velocity
- Increase the velocity of the bubbles when the user misses
- Make the bubbles appear different sizes

When you are ready to submit your solution, clean your project (Build → Clean Project from the menu), then zip up your project. Then rebuild the APK file (Build → Build APK from the menu) for your project.

Submit the zip file and app\build\outputs\apk\app-debug.apk to Easel. **Note:** The app-debug.apk file should be more than 1 MB. If it's smaller, then it's a partial APK meant for Instant Run. You must turn in the full APK file.

Implementation

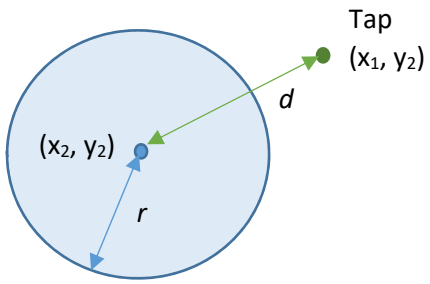
All text should be drawn using the canvas. No new Views should be added to the layout.

To capture taps, override the `onTouchEvent()` method in BounceSurfaceView. When you detect an `ACTION_DOWN` event, call a method on the BounceThread that a tap has occurred at the (x, y) location of the event. The BounceThread should tell the AnimationArena that a tap has occurred and passes along the (x, y) location of the tap. The AnimationArena should determine which ball if any was tapped by calling a Boolean `ballTouch()` method on each ball.

To implement `ballTouch(tapX, tapY)`, the method needs to determine if the given tap (x, y) is inside the ball.

The distance *d* from the tap (x_1, y_1) to the circle's center (x_2, y_2) is calculated using the distance formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



If *d* ≤ the circle's radius *r*, then the tap is on or in the circle:

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \leq r$$

However, performing a square root is a costly operation in terms of CPU cycles, so the square root calculation can be avoided by squaring both sides of the equation:

$$(x_2 - x_1)^2 + (y_2 - y_1)^2 \leq r^2$$

Use this final equation in `ballTouch()` to determine if the user tapped the ball.

McChallenge

1% added to your final grade can be earned by completing the McChallenge extra credit. Create a Pong app that uses the same architecture as the Bubble Pop app. Display a paddle at the bottom of the screen that is controlled by touches. The balls bounce off the paddle, and one point is awarded for each ball bounce. If a ball hits the bottom of the screen, the ball disappears, and the user loses 10 points. Increase the velocity of the balls as the user's score increases. When no balls are left, the game is over.

Zip your solution and email it to me no later than **Dec 9**.