Algorithm for Collision Calculations of a Circle and a Box:

First, note that we want to represent the bounds of the circle (the player) and the rectangle (our colliding box) as mathematical inequalities.

We can represent our circle as a circle equation as an inequality:

R^2 > (x-x\_center)^2 + (y-y\_center)^2

And we can represent our box as a system of bounds/inequalities:

y > lower\_bound\_y

y < upper\_bound\_y

x > lower\_bound\_x

x < upper\_bound\_x

thus, our algorithm determines whether the point on the rectangle closest to the circle satisfies the top inequality. If it does, then we know that we must have a collision:

1. Determine the point of the rectangle which is closest to the circle’s center. Because we have equal radius all around, we also have that this is the closest point to the circle as a whole.  
   **Closest\_x, Closest\_y**
   1. For each x, y they will match one of three cases:
      1. The center of the circle is within the bounds of the rectangles coordinates. In this case, the center of the circle’s coordinate is equal to the closest\_x/y
      2. The center is above the bounds of the rectangle’s coordinates. In this case, the closest point is the top coordinate of the rectangle bound
      3. The center is below the bounds of the rectangle’s coordinates. In this case, the closest point is the bottom coordinate of the rectangle bound.
2. Now we find the distance from the center of the circle to these points, and label them dx and dy
3. Dx^2 + dy^2 should be less than the squared radius. If this is true, then the two objects are colliding. If not, then they are not colliding.

**Note:** Slight optimization can be made by only checking collisions of objects in certain regions. For example, we can only check collisions of objects that are below a certain height (one full height block above the circle center).