

# Collision Detection

## Circle in Circle Collision

To figure out if 2 circles are colliding, you must first find the distance between both of those circles.

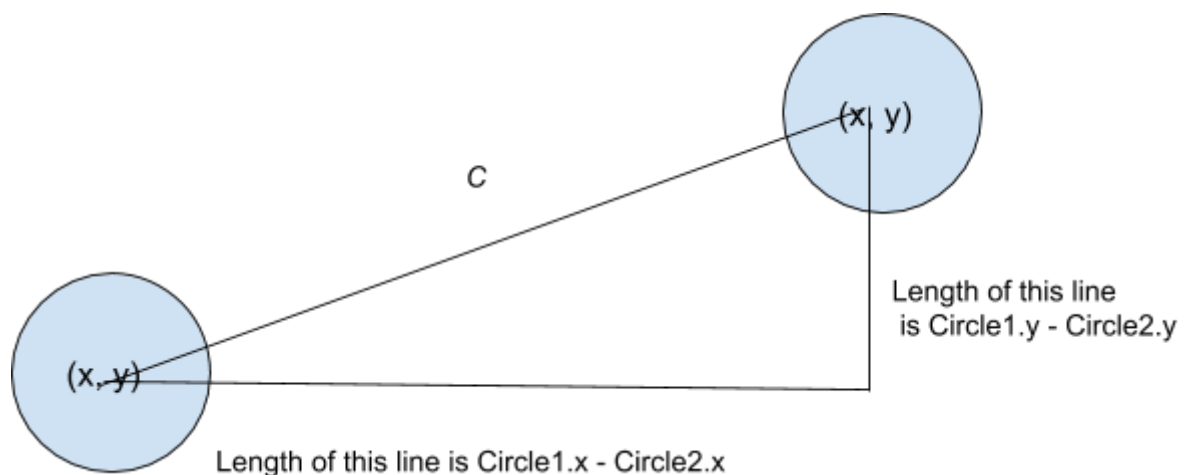
The circles can be thought of as an x and a y, which is their position within a coordinates system, and a radius. We must use the x and y of both circles to find the distance between the circles.

This can be done using the Pythagoras Theorem, finding the distance using this method will work for any 2 objects that have an x and a y.

$A^2 + B^2 = C^2$  is the equation, if we substitute  $A^2$  for the x of the first circle minus the x of the second circle, and do the same for  $B^2$  but with the y of both circles, we get something that looks like this:

$$A^2 = \text{Circle1.x} - \text{Circle2.x}$$

$$B^2 = \text{Circle1.y} - \text{Circle2.y}$$

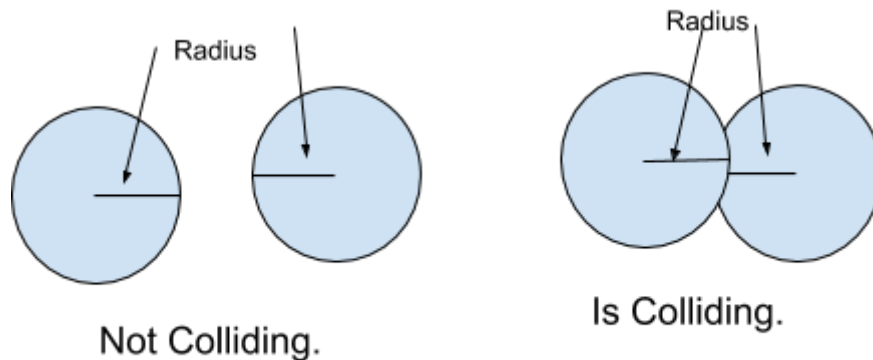


As seen above, this essentially creates a triangle where the longest side (ie. distance between the circles) is equal to  $C$ .

So, knowing what we know, we can add  $A^2$  and  $B^2$  together, *which will give us  $C^2$* , which, if we find the square root of, will give us  $C$ , the distance between the two circles.

Now we have the distance between the two circles, we must add both of the circle's radius together and calculate whether or not the result is more than or equal to the previously calculated distance.

Because the radius is the outermost point of the circle, it makes sense that if both outermost points of the circles are more than the distance between the circles, they will be overlapping.



All of this means that using the equation below, you can find out if two circles are colliding.

*Collision = CIRCLE1.radius + CIRCLE2.radius >= DISTANCE;*

### **Point in Circle**

Finding out if a point is colliding with a circle is the same as circle within circle, except we treat the point as a circle with a radius of 0, and so only use the circle's radius in the calculation.

This would make the equation above:

*Collision = CIRCLE.radius >= DISTANCE;*