MCC9-12.G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
• Translate between the geometric description and the equation for a circle

A bakery firm makes gingerbread men each 14 cm high with circular heads and bodies. They are creating a gingerbread Logo and they need help in finding equations of the gingerbread man so that it can be programmed into a computer. Someone has already determined the equation of the body $x^2 + y^2 -10x - 12y + 45 = 0$ but they quit so they need your help in find the equation of the head.
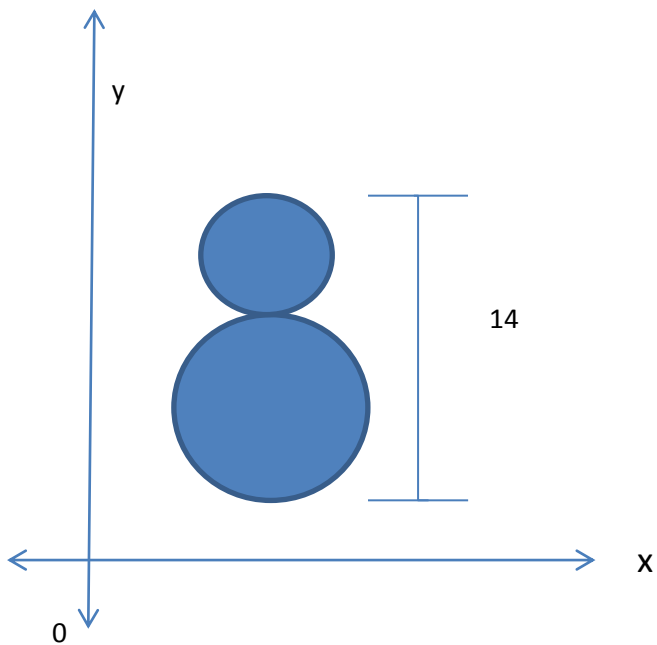
Solution: Since the equation for the circular body is $x^2 + y^2 -10x - 12y + 45 = 0$ by factoring the center form of the circle is $(x-5)^2 + (y-6)^2 = 16$. This demonstrates that the radius of the larger circle is 4 cm and a diameter of 8 cm. 14 – 8 gives 6 cm for the diameter of the head. Thus the radius of the smaller circle is 3 cm. The x value in the equation of the little circle will remain the same as the larger circle. Since the smaller circle's radius is 7cm up from the center of the larger circle, the equation of the smaller circle will be $(x-5)^2 + (y - 13)^2 = 9$ or $x^2 + y^2- 10x - 26y +185 = 0$.