

Setting R to be the radius of our circle O and r to be the radius of the required circle, we get the following equation (Pythagorean theorem).

$$r^2 + (R - h + r)^2 = (R - r)^2$$

$$r^2 + R^2 - Rh + Rr - Rh + h^2 - rh + Rr - rh + r^2 = R^2 - 2Rr + r^2$$

After we simplify and move some things around, we get

$$r^2 + rRr - 2rh = 2Rh - h^2$$

This is as far as I could follow the proof solution for. As I progressed to the next step, I did not see how it continued to equal the original equation.