2. R is the radius of the semicircle, CX = r, and OC = a.

Since r is the radius of the little circle, we can construct a right triangle with sides r, (a+r), and R – r (from the center of the circle to the semicircle is r and the dotted line from O to the outside of the semicircle is R.). We can then use the Pythagorean Theorem and we would have

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

After foiling: $r^2 + a^2 + 2ar + r^2 = R^2 - 2Rr + r^2$

After subtracting a^2 from both sides, and adding 2Rr and r^2 to both sides:

$r^2 + 2ar + r^2 + 2Rr - r^2 = R^2 - a^2$

After combining like terms and factoring: $r^2 + 2r(R + a) = R^2 - a^2$

Looking at the right side of our equation ($R^2 - a^2$), and knowing POC is a right triangle from the construction, we know that $R^2 - a^2 = CP^2$. Side OP is equal to R because it is the radius of the semicircle.

Let's start with $(R + a + r)^2$ with is equal to $(R + a)^2 + CP^2$ and based on the triangle ACP

We get that by the Pythagorean theorem $(R + a)^2 + CP^2 = AP^2$.

By taking the square root of both sides, AP = R + a + r which is also equal to AX. Thus, AP =AX.