1. If $\mathcal{C}$ and $\mathcal{D}$ are circles with respective centers C and D which intersect at a point R, show that the tangents at R to the two circles are perpendicular if and only if each tangent passes through the center of the other circle.

Note: This gives a necessary and sufficient condition for two circles to be orthogonal.

2. Given a circle $\mathcal{C}$ and P, P' two distinct points inverse to each other with respect to $\mathcal{C}$, suppose that $\mathcal{D}$ is a circle that contains P and P'. Show that the circle $\mathcal{D}$ is orthogonal to $\mathcal{C}$.

3. This is a converse of the statement 2. If $\mathcal{C}$ and $\mathcal{D}$ are two circles which intersect orthogonally, then any diameter of $\mathcal{C}$ cuts $\mathcal{D}$ in a pair of points which are inverse with respect to $\mathcal{C}$.