Problem 6: Squares $\bmod\ p$

An element $x \in \mathbb{Z}_m$, where m is a positive integer, is called a square if there exists $y \in \mathbb{Z}_m$ such that $x \equiv y^2 \bmod m$. Let p be an odd prime. Find the number of non-zero squares $\bmod\ p$. Justify your answer.

As always, show your work, fully explain and justify your answer. A solution mainly obtained by computers or calculators will not be accepted.