Consider the fixed rate mortgage of $M$ dollars, for $T$ months, with yearly interest $p$ %. We want to calculate the monthly payment $x$ (in dollars); without the escrow. Denote the debt after $t$ months by $d(t)$. Then,

$$d(0) = M, \quad d(T) = 0.$$  

Each month we pay $x$ dollars, which are divided between the interest and principal. The interest is $\frac{p}{12}$ % of the current debt $d(t)$, that is, $d(t) \frac{p}{1200}$ dollars. The rest is the principal, so next month the debt is

$$d(t + 1) = d(t) - \left( x - \frac{d(t)p}{1200} \right) = d(t) \left( 1 + \frac{p}{1200} \right) - x.$$  

This means that we iterate the map $f$, given by

$$f(y) = \left( 1 + \frac{p}{1200} \right) y - x.$$  

To find the formula for the $n$-th iterate of $f$, we find the fixed point $y_0$ of $f$ by solving the equation

$$y_0 = \left( 1 + \frac{p}{1200} \right) y_0 - x.$$  

The solution is $y_0 = \frac{1200x}{p}$. Thus, we write our map in the new coordinate $z = y - y_0$ as

$$g(z) = \left( 1 + \frac{p}{1200} \right) z,$$

so

$$g^n(z) = \left( 1 + \frac{p}{1200} \right)^n z.$$  

Going back to the old coordinate, we get

$$f^n(y) = \left( 1 + \frac{p}{1200} \right)^n (y - y_0) + y_0 = \left( 1 + \frac{p}{1200} \right)^n \left( y - \frac{1200x}{p} \right) + \frac{1200x}{p}.$$  

Hence,

$$\left( 1 + \frac{p}{1200} \right)^T \left( M - \frac{1200x}{p} \right) = 0.$$  

Solving it we get

$$\left( 1 + \frac{p}{1200} \right)^T M = \frac{1200x}{p} \left( \left( 1 + \frac{p}{1200} \right)^T - 1 \right),$$

so we get the formula for $x$:

$$x = \frac{\left( 1 + \frac{p}{1200} \right)^T M}{\left( 1 + \frac{p}{1200} \right)^T - 1} \cdot \frac{p}{1200} \cdot M.$$