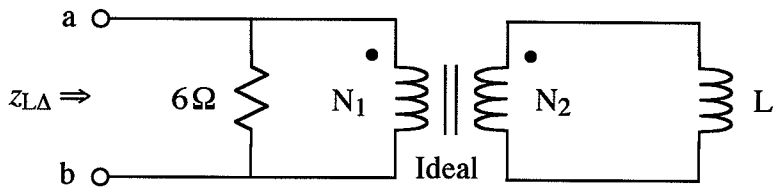
Ex:



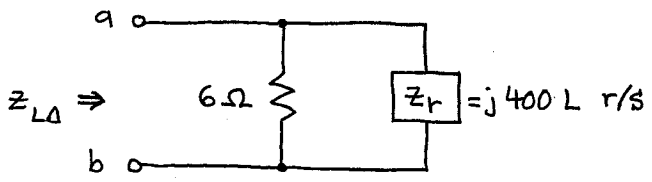
Given $N_1/N_2 = 2$ and $\omega = 100$ rad/s, find a numerical value for L to make $z_{L\Delta} = 3 + j3\,\Omega$.

soln: We use the idea of reflected impedance.

We replace the transformer and the secondary's impedance, z_L, with z_r:

$$z_r = \left(\frac{N_1}{N_2}\right)^2 j\omega L = 2^2 \cdot j\,100\,r/s\; L$$

circuit model:



We are given $z_{L\Delta} = 3 + j3\,\Omega = 3(1+j)\,\Omega$.

Since we have parallel impedances, it simplifies matters if we use conductance:

$$\frac{1}{z_{L\Delta}} = \frac{1}{3(1+j)\,\Omega} = \frac{1}{6\,\Omega} + \frac{1}{j400\,L\;r/s}$$

$$\frac{1}{z_{L\Delta}} = \frac{1-j}{3\underbrace{(1+j)(1-j)}_{2}\,\Omega} = \frac{1}{6\,\Omega} + \frac{-j}{400L\;r/s}$$

$$\frac{1}{Z_{L\Delta}} = \frac{1}{6\Omega} - \frac{j}{6\Omega} = \frac{1}{6\Omega} - \frac{j}{400L\ r/s}$$

We have $400L\ r/s = 6\Omega$

or $$L = \frac{6\Omega}{400\ r/s}$$

or $L = 15\ mH$