44. (a) Voltage is proportional to inductance (by Eq. 31-37) just as, for resistors, it is proportional to resistance. Now, the (independent) voltages for parallel elements are equal ($V_1 = V_2$), and the currents (which are generally functions of time) add ($i_1(t) + i_2(t) = i(t)$). This leads to the Eq. 28-21 for resistors. We note that this condition on the currents implies

$$\frac{di_1(t)}{dt} + \frac{di_2(t)}{dt} = \frac{di(t)}{dt} \ .$$

Thus, although the inductance equation Eq. 31-37 involves the rate of change of current, as opposed to current itself, the conditions that led to the parallel resistor formula also applies to inductors. Therefore,

$$\frac{1}{L_{\text{eq}}} = \frac{1}{L_1} + \frac{1}{L_2} \ .$$

(b) To ensure the independence of the voltage values, it is important that the inductors not be too close together (the related topic of mutual inductance is treated in §31-12). The requirement is that the field of one inductor not have significant influence (or "coupling") in the next.

(c) Just as with resistors, $\frac{1}{L_{\text{eq}}} = \sum_{n=1}^{N} \frac{1}{L_n}$.