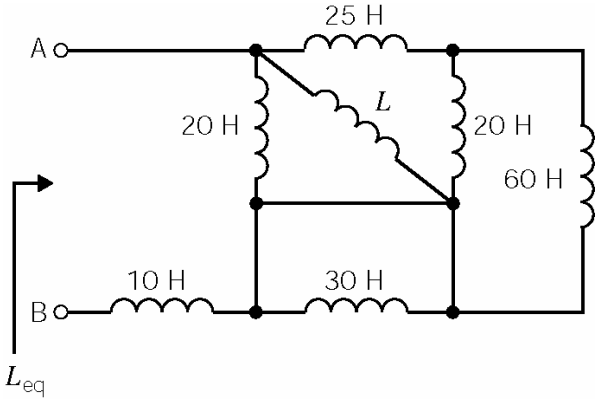
Example:

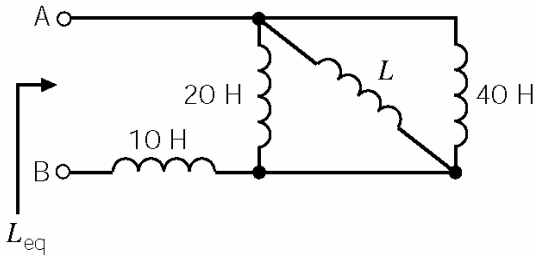


This circuit is equivalent to a single inductor having inductance $L_{eq} = 18$ H. Determine the value of the inductance *L*.

Solution:
The 25 H inductor is in series with a parallel combination of 20 H and 60 H inductors. The inductance of the equivalent inductor is

$$25 + \frac{60 \times 20}{60 + 20} = 40 \text{ H}$$

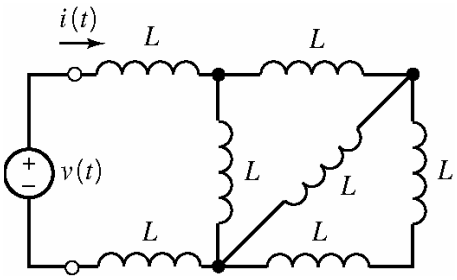
The 30 H inductor is in parallel with a short circuit, which is equivalent to a short circuit. After making these simplifications, we have



Then

$$18 = L_{eq} = 10 + \frac{1}{\frac{1}{20} + \frac{1}{L} + \frac{1}{40}} \quad \Rightarrow \quad \frac{1}{20} + \frac{1}{L} + \frac{1}{40} = \frac{1}{8} \quad \Rightarrow \quad L = 20 \text{ H}$$

Example:



This circuit contains 7 inductors each having inductance L. The voltage source voltage is given by

$$v(t) = 4\cos(3t) \text{ V}$$

Find the current $i(t)$ when $L = 4$ H.

Solution:

The equivalent inductance is:

$$\frac{\left(\frac{L\times 2L}{L+2L}+L\right)\times L}{\left(\frac{L\times 2L}{L+2L}+L\right)+L}+2L=\frac{21}{8}L$$

Then

$$i(t)=\frac{1}{\frac{21}{8}L}\int_{-\infty}^{t}4\cos(3\tau)\,d\tau=\frac{8}{21\times 4}\times\frac{4}{3}\sin(3t)=127\sin(3t) \text{ mA}$$