

49. We use $P = i^2 R = i^2 \rho L/A$, or $L/A = P/i^2 \rho$. So the new values of L and A satisfy

$$\left(\frac{L}{A}\right)_{\text{new}} = \left(\frac{P}{i^2 \rho}\right)_{\text{new}} = \frac{30}{4^2} \left(\frac{P}{i^2 \rho}\right)_{\text{old}} = \frac{30}{16} \left(\frac{L}{A}\right)_{\text{old}} .$$

Consequently, $(L/A)_{\text{new}} = 1.875(L/A)_{\text{old}}$. Note, too, that $(LA)_{\text{new}} = (LA)_{\text{old}}$. We solve the above two equations for L_{new} and A_{new} :

$$\begin{aligned} L_{\text{new}} &= \sqrt{1.875} L_{\text{old}} = 1.369 L_{\text{old}} \\ A_{\text{new}} &= \sqrt{1/1.875} A_{\text{old}} = 0.730 A_{\text{old}} . \end{aligned}$$