Answer on Question #42652-Physics-Electric Circuits

A rectangular metal block has dimensions 3 cm × 1 cm × 1 cm. The ratio of the resistance measured between the two opposite rectangular faces to that measured between the two square faces of the block is
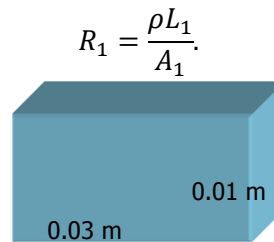
A 1 : 3 B 1 : 9 C 3 : 1 D 9 : 1

Solution

$$L_2 = 0.01 \, m, \qquad L_1 = 0.03 \, m.$$

The area of a square end is $A_1 = L_2^2$.

The resistance of the block measured between the two square ends

$$R_1 = \frac{\rho L_1}{A_1}.$$

0.01 m

0.03 m

The area of a rectangular face is $A_2 = L_1 \cdot L_2$.
The resistance between two opposing rectangular faces

$$R_2 = \frac{\rho L_2}{A_2}.$$

The ratio of the resistance measured between the two opposite rectangular faces to that measured between the two square forces of the block is

$$\frac{R_2}{R_1} = \frac{A_1 L_2}{L_1 A_2} = \frac{(L_2^2) L_2}{L_1 (L_1 \cdot L_2)} = \left(\frac{L_2}{L_1}\right)^2 = \left(\frac{0.01}{0.03}\right)^2 = \frac{1}{9}.$$

Answer: B 1 : 9 .