A room is a cube that is 3.0 meters on a side. The six faces of the room have a thermal conductivity of $0.07\frac{\mathrm{W}}{\mathrm{m}\cdot C^{\circ}}$ and are 0.06 meters thick. You put an electric heater inside with a power output of 630 Watts. The temperature outside the box is $13℃$. When the room reaches equilibrium what will be the temperature inside the room.

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The cube has six sides and each side is 3 by 3 meters so the total surface area is $A = 6 \cdot (3.0\text{m})^2 = 54\text{m}^2$. The thermal conduction equation is

$$\frac{dQ}{dt} = kA\frac{\Delta T}{\Delta x}$$

$$\longrightarrow \ \Delta T = \frac{\Delta x}{kA}\ \frac{dQ}{dt} = \frac{(0.06\text{m})}{(0.07\frac{\text{W}}{\text{m}\cdot C^\circ})(54\text{m}^2)}(630\text{W}) = 10C^\circ$$

$\Delta T = T_{\text{inside}} - T_{\text{outside}} \ \longrightarrow \ T_{\text{inside}} = T_{\text{outside}} + \Delta T = 13^\circ\!C + 10C^\circ = 23^\circ\!C$