An Alfa Romeo sports sedan has a four-cylinder engine. At the beginning of its compression stroke, one of the cylinders contains 548 cm^3 of air at atmospheric pressure (1.01 x 10^5 Pa) and a temperature of 27.0°C. At the end of the stroke, the air has been compressed to a volume of 54.8 cm^3 and the gauge pressure has increased to 2.44 x 10^6 Pa. Compute the final temperature.

What do we know? The ideal gas law:

$$PV = nrT \qquad P \text{ in absolute pressure}$$

$$n = cons\tan t \qquad T \text{ in Kelvin}$$

$$\Rightarrow \frac{PV}{T} = cons\tan t$$

Notes: Since we deal with ratios, any units suffice
$P_{final} = P_{atm} + P_{gauge} = 2.54 \times 10^6$ Pa
T(K) = T(°C) + 273 K

Solution:

$$\frac{\left(1.07\times10^5\,Pa\right)\left(548cc\right)}{300\,K} = \frac{\left(2.54\times10^6\,Pa\right)\left(54.8cc\right)}{T_f}$$

$$\Rightarrow T_f = 732\,K = 482\,^oC$$

Note: We have said nothing about how we went from the initial state to the final state.
Do we know anything about energy, work, or heat?