Given:

Air is compressed in a car engine from 22°C and 95 kPa in a reversible and adiabatic manner.

$$T_1 := 22\,°C = 295.15\,K \qquad P_1 := 95kPa$$

Required:

If the compression ratio (v_1/v_2) of the engine is 8, determine the final temperature of the air.

Solution:

The compression ratio is defined as

$$r_c := 8$$

Going to Table A-17 @ $T_1 = 295.15K$ shows that interpolation is needed. This is shown below.

$$T_a := 295K \qquad T_b := 298K$$

$$\nu_{ra} := 647.9 \qquad \nu_{rb} := 631.9$$

$$\nu_{r1} := \frac{T_1 - T_a}{T_b - T_a}\cdot\left(\nu_{rb} - \nu_{ra}\right) + \nu_{ra} = 647.1$$

The relative specific volume at state 2 may then be found by

$$\nu_{r2} = \frac{\nu_2}{\nu_1}\cdot\nu_{r1} \qquad \text{or} \qquad \nu_{r2} := \frac{\nu_{r1}}{r_c} = 80.9$$

Going to Table A-17 @ $\nu_{r2} = 80.9$ shows that interpolation is need.

$$\nu_{ra} := 85.34 \qquad \nu_{rb} := 81.89$$

$$T_a := 650K \qquad T_b := 660K$$

$$\boxed{T_2 := \frac{\nu_{r2} - \nu_{ra}}{\nu_{rb} - \nu_{ra}}\cdot\left(T_b - T_a\right) + T_a = 662.9\,K} \qquad T_2 = 389.8\cdot°C$$