Given and Required:
Determine the specific volume of R-134a at 1 MPa and 50°C. Use the ideal gas equation and also use the compressibility chart. What is it listed as in the tables in the back of your textbook?

$P_1 := 1\ \text{MPa} \qquad T_1 := 50\ °\text{C} = 323.15\ \text{K}$

Solution:
Going to Table A-1 @ R-134a shows

$R_{R134a} := 0.08149\ \frac{\text{kJ}}{\text{kg K}} \qquad T_{cr} := 374.2\ \text{K} \qquad P_{cr} := 4.059\ \text{MPa}$

Beginning with the IGL.

$P \cdot V = m \cdot R \cdot T$

Solving for specific volume yields

$\left(v = \frac{V}{m}\right) = \frac{R \cdot T}{P}$ or $\boxed{v_a := \frac{R_{R134a} \cdot T_1}{P_1} = 0.02633\ \frac{\text{m}^3}{\text{kg}}}$

To use the compressibility chart, the reduce temperature and pressure values, T_R and P_R, must be calculated. This is shown below.

$T_R := \frac{T_1}{T_{cr}} = 0.8636 \qquad P_R := \frac{P_1}{P_{cr}} = 0.2464$

Going to Figure A-15 @ $T_R = 0.8636$ and $P_R = 0.2464$ shows

$z := 0.84$

Now the specific volume may be calculated with the compressibility factor accounted for. This is shown below.

$v = \frac{V}{m} = z\ \frac{R\ T}{P}$ or $\boxed{v_b := z \cdot \frac{R_{R134a} \cdot T_1}{P_1} = 0.02212\ \frac{\text{m}^3}{\text{kg}}}$

To look up the specific volume from the table, we start at Table A-12 @ $P := P_1 = 1\ \text{MPa}$ showing

$T_{sat} := 39.37\ °\text{C}$

Since the temperature is greater than the saturation temperature at the pressure given (i.e. $T_1 < T_{sat}$), the state is superheated. Going to Table A-13 @ $P := P_1 = 1\ \text{MPa}$ and $T_1 = 50\ °\text{C}$ shows

$\boxed{v_c := 0.021796\ \frac{\text{m}^3}{\text{kg}}}$

Comparing the results of using the IGL and the method using compressibility chart to the table values shows the percent error as

$\%e_a := \left|\frac{v_a - v_c}{v_c}\right| = 20.82\ \% \qquad \%e_b := \left|\frac{v_b - v_c}{v_c}\right| = 1.487\ \%$

It should be noted that the table value is considered the most accurate of the three methods and for this reason the other two methods are compared to it.