Part II DATA SECTION

γ = 1.35

C_v = 1 [kJ/kg]

x_r = 0.05

AF = 15

Q_{LHV} = 42000 [kJ/kg]

V_1 = 0.0012 [m^3]

V_2 = 0.00015 [m^3]

1. Compression ratio

$$r = \frac{V_1}{V_2}$$

2. equivalent heat release

$$qstar = \left[\frac{1 - x_r}{1 + AF}\right] \cdot Q_{LHV} \quad [kJ/kg]$$

3. Temperatures and Pressures

T_1 = 300 [K]

P_1 = 80 [kPa]

$$P_2 = P_1 \cdot r^{\gamma} \quad [kPa]$$

$$T_2 = T_1 \cdot r^{[\gamma - 1]} \quad [K]$$

$$qstar = C_v \cdot [T_3 - T_2]$$

$$\frac{P_3}{T_3} = \frac{P_2}{T_2}$$

$$T_4 = \frac{T_3}{r^{[\gamma - 1]}}$$

$$P_4 = \frac{P_3}{r^{\gamma}}$$

4. Fuel Conversion Efficiency

$$\eta = 1 - \frac{1}{r^{[\gamma - 1]}}$$

5. Imep

Calculate mass processed

$$R_g = [\gamma - 1] \cdot C_v$$

$$P_1 \cdot V_1 = mass \cdot R_g \cdot T_1$$

$$w_c = \eta \cdot qstar$$

$$W = mass \cdot w_c$$

$$imep = \frac{W}{V_1 - V_2}$$

6. The efficiency will be significantly higher in this analysis than in a real engine.

Unit Settings: [kJ]/[K]/[kPa]/[kmol]/[radians]

AF = 15	C_v = 1 [kJ/kg]	η = 0.517	γ = 1.35	imep = 1123
mass = 0.0009143	P_1 = 80 [kPa]	P_2 = 1325 [kPa]	P_3 = 6645 [kPa]	P_4 = 401.2 [kPa]
qstar = 2494 [kJ/kg]	Q_{LHV} = 42000 [kJ/kg]	r = 8	R_g = 0.35	T_1 = 300 [K]
T_2 = 621.2 [K]	T_3 = 3115 [K]	T_4 = 1504 [K]	V_1 = 0.0012 [m^3]	V_2 = 0.00015 [m^3]
W = 1.179	w_c = 1289	x_r = 0.05		