2nd Law of Thermodynamics - 1

Compressed Gas (1): Integrate

$$\frac{dT}{T} = -\frac{nR}{C_V}\frac{dV}{V} \quad \text{with} \quad C_V = 2.5\, nR\,.$$

Efficiency of a Heat Engine (2): $T_h = T_c/(1 - ef)$ with h hot, c cold and ef efficiency.

Heat Engine (3): Given is the Power P in units of $W = J/s$, the efficiency ef and the number of cycles n_c per s. .
1. The work per cycle is then just $W = P \,/\, n_c$.
2. The heat rejected per cycle follows then from $W = ef\ Q_{\text{input}}$, $Q_{rc} = (1 - ef)\, Q_{\text{input}} = \ldots W$.

Ideal Heat Engine (4): 1. Work done: $W = ef\ Q_h$ (hot reservoir).
2. Coefficient of performance of an ideal refrigerator: $cop = Q_c/W$ (cold reservoir).

2nd Law of Thermodynamics - 2

Carnot Engine (5). 1. Efficiency $ef = 1 - T_c/T_h$ (cold/hot).

2. Work done: $W = ef\ Q_h$ (per cycle).

3. Heat rejected: $Q_r = Q_h - ef\ Q_h$.

4. Coefficient of performance: $cop = Q_r/W$.