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"GIVEN:  A 4-stroke, 4-cylinder IC engine modeled with the Otto Cycle,"

    a$ = 'air_ha'
    rpm = 2800[rev/min]
    P[1] = 14.7[psia]
    T[1] = 80[F]
    Vol_1 = 34[in^3]*convert(in^3,ft^3)
    P[3] = 990[psia]
    CR = 10
    N_r = 2[rev]    "4-stroke engine"

"FIND: (a) the power developed by the engine (hp)
       (b) the thermal efficiency of the cycle
       (c) the mean effective pressure of the engine (hp)"

"SOLUTION:"
"!PROPERTIES"
"State 1: P[1], T[1]"
    v[1] = volume(a$,P=P[1],T=T[1]);
    u[1] = intenergy(a$,P=P[1],T=T[1])
    s[1] = entropy(a$,P=P[1],T=T[1])
"State 2: v[2], s[2]"
    CR = v[1]/v[2]
    P[2] = pressure(a$,v=v[2],s=s[2])
    T[2] = temperature(a$,v=v[2],s=s[2])
    u[2] = intenergy(a$,v=v[2],s=s[2])
    s[2] = s[1]
"State 3: P[3],v[3]"
    T[3] = temperature(a$,P=P[3],v=v[3])
    v[3] = v[2]
    u[3] = intenergy(a$,P=P[3],v=v[3])
    s[3] = entropy(a$,v=v[3],T=T[3])
"State 4: v[4], s[4]=s[3]"
    P[4] = pressure(a$,v=v[4],s=s[4])
    T[4] = temperature(a$,v=v[4],s=s[4])
    v[4] = v[1]
    u[4] = intenergy(a$,v=v[4],s=s[4])
    s[4] = s[3]

"!THERMODYNAMICS"
"The net work delivered per cylinder is,"
    W_net = W_34 - W_12
    W_34 = m*(u[3] - u[4])
    W_12 = m*(u[2] - u[1])

"The mass of air trapped in the cylinder is,"
    m = Vol_1/v[1]

"The thermal efficiency of the cycle is,"
    eta_th = W_net/Q_23
    Q_23 = m*(u[3] - u[2])

"The mean effective pressure of the cycle is,"
    mep = W_net*convert(Btu,in-lbf)/(Vol_disp*convert(ft^3,in^3))
    Vol_disp = m*(v[1] - v[2])

"The power developed by the engine is,"
"!This is a 4-stroke engine, therefore 2 revolutions of the crankshaft are required to execute a cycle.
 In addition, there are 4 cylinders in the engine.  The values calculated above are per cylinder."
    W_dot_net = 4*W_net*(rpm/N_r)*convert(Btu/min,hp)
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Arrays Table: Main

	T_i [F]	P_i [psia]	v_i [ft^3/lbm]	u_i [Btu/lbm]	s_i [Btu/lbm-F]
1	80	14.7	13.6	92.03	1.64
2	859.9	363.4	1.36	231.1	1.64
3	3123	990	1.36	717.7	1.851
4	1266	47.07	13.6	311.3	1.851