29. (a) $I_1 = \dfrac{V}{R_1} = \dfrac{20\text{ V}}{20\ \Omega} = \boxed{1.0\text{ A}}$. R_2 and R_3 are in series: $R_s = 20\ \Omega + 20\ \Omega = 40\ \Omega$.

So $I_2 = I_3 = \dfrac{20\text{ V}}{40\ \Omega} = \boxed{0.50\text{ A}}$.

(b) $V_1 = \boxed{20\text{ V}}$, $V_2 = V_3 = I_2R_2 = (0.50\text{ A})(20\ \Omega) = \boxed{10\text{ V}}$.

(c) The total power is $P = \dfrac{V^2}{R_1} + \dfrac{V^2}{R_s} = \dfrac{(20\text{ V})^2}{20\ \Omega} + \dfrac{(20\text{ V})^2}{40\ \Omega} = \boxed{30\text{ W}}$.

37. (a) R_1 and R_2 are in series. $R_{s1} = 10\ \Omega + 5.0\ \Omega = 15\ \Omega$.

So $I_1 = I_2 = \dfrac{V}{R_{s1}} = \dfrac{10\text{ V}}{15\ \Omega} = \boxed{0.67\text{ A}}$ $I_3 = \dfrac{10\text{ V}}{10\ \Omega} = \boxed{1.0\text{ A}}$.

R_4 and R_5 are in series. $R_{s2} = 5.0\ \Omega + 20\ \Omega = 25\ \Omega$. So $I_4 = I_5 = \dfrac{10\text{ V}}{25\ \Omega} = \boxed{0.40\text{ A}}$.

(b) $V_1 = I_1 R_1 = (0.667\text{ A})(10\ \Omega) = \boxed{6.7\text{ V}}$, $V_2 = (0.667\text{ A})(5.0\ \Omega) = \boxed{3.3\text{ V}}$, $V_3 = \boxed{10\text{ V}}$,

$V_4 = (0.40\text{ A})(5.0\ \Omega) = \boxed{2.0\text{ V}}$, $V_5 = (0.40\text{ A})(20\ \Omega) = \boxed{8.0\text{ V}}$.

97. (a) R_2, R_3, and R_4 are in parallel combination,

$\dfrac{1}{R_p} = \dfrac{1}{25\ \Omega} + \dfrac{1}{50\ \Omega} + \dfrac{1}{25\ \Omega} = \dfrac{1}{10\ \Omega}$, so $R_p = 10\ \Omega$.

So the total current is $I = I_1 = \dfrac{110\text{ V}}{100\ \Omega + 10\ \Omega} = \boxed{1.0\text{ A}}$.

The voltage on R_p is $(1.0\text{ A})(10\ \Omega) = 10\text{ V}$.

Therefore $I_2 = I_4 = \dfrac{10\text{ V}}{25\ \Omega} = \boxed{0.40\text{ A}}$, $I_3 = \dfrac{10\text{ V}}{50\ \Omega} = \boxed{0.20\text{ A}}$.

(b) $P_1 = I^2 R_1 = (1.0\text{ A})^2\,(100\ \Omega) = \boxed{100\text{ W}}$, $P_2 = P_4 = (0.40\text{ A})^2\,(25\ \Omega) = \boxed{4.0\text{ W}}$,

$P_3 = (0.20\text{ A})^2\,(50\ \Omega) = \boxed{2.0\text{ W}}$.

99. Use the results in Exercise 18.98,

The current through the first two R's (from left) is

$I_1 = I_2 = \dfrac{V}{R_{s3}} = \dfrac{12.0\text{ V}}{2.73(10.0\ \Omega)} = \boxed{0.440\text{ A}}$.

The voltage across R_{p2} is $V_{p2} = I_1 R_{p2} = (0.440\text{ A})\,\dfrac{11}{15}\,(10.0\ \Omega) = 3.23\text{ V}$.

So the current through the third R is $I_3 = \dfrac{3.23\text{ V}}{10.0\ \Omega} = \boxed{0.323\text{ A}}$.

The current through the next two R's is $I_4 = I_5 = \dfrac{3.23\text{ V}}{11(10.0\ \Omega)/4} = \boxed{0.117\text{ A}}$.

The voltage across R_{p1} is $V_{p1} = I_4 R_{p1} = (0.117\text{ A})\,\dfrac{3}{4}\,(10.0\ \Omega) = 0.878\text{ V}$.

So $I_6 = \dfrac{0.878\text{ V}}{10.0\ \Omega} = \boxed{0.0878\text{ A}}$, $I_7 = I_8 = I_9 = \dfrac{0.878\text{ V}}{3(10.0\ \Omega)} = \boxed{0.0293\text{ A}}$.

61. $P = \dfrac{V^2}{R}$, ☞ $R = \dfrac{V^2}{P} = \dfrac{(120\text{ V})^2}{100\text{ W}} = \boxed{144\ \Omega}$.

62. $P = \dfrac{V^2}{R} = \dfrac{(110\text{ V})^2}{10\ \Omega} = \boxed{1.2 \times 10^3\text{ W}}$.

63. $P = I^2R = (13\text{ A})^2(12\ \Omega) = \boxed{2.0 \times 10^3\text{ W}}$.

65. $P = \dfrac{V^2}{R}$, ☞ $R = \dfrac{V^2}{P} = \dfrac{(240\text{ V})^2}{50 \times 10^3\text{ W}} = \boxed{1.2\ \Omega}$.

68. (a) $I = \dfrac{V}{R} = \dfrac{1.50\text{ V}}{2.50\ \Omega} = \boxed{0.600\text{ A}}$.

(b) $q = It = (0.600\text{ A})(6.00\text{ h})(3600\text{ s/h}) = \boxed{1.30 \times 10^4\text{ C}}$.

(c) $E = qV = (1.30 \times 10^4\text{ C})(1.50\text{ V}) = \boxed{1.94 \times 10^4\text{ J}}$.

Alternate method: $E = pt = I^2Rt = (0.600\text{ A})^2(2.50\ \Omega)(6.00\text{ h})(3600\text{ s/h}) = 1.94 \times 10^4\text{ J}$.

69. (a) $E = Pt = IVt = (18\text{ A})(240\text{ V})(1.0\text{ s}) = \boxed{4.3 \times 10^3\text{ J}}$.

(b) $R = \dfrac{V}{I} = \dfrac{240\text{ V}}{18\text{ A}} = \boxed{13\ \Omega}$.

70. (a) $E = P\,t = (4.5\text{ kW})(2.0\text{ h/d})(30\text{ d}) = 270\text{ kWh}$.

So it costs $(270\text{ kWh})(15\text{ ¢/kWh}) = \boxed{\$40.50}$.

(b) From Table 17.2, a water heater draws 37.5 A at 240 V. So $R = \dfrac{V}{I} = \dfrac{240\text{ V}}{37.5\text{ A}} = \boxed{6.4\ \Omega}$.

82. (a) The input power to the pump is $P = \dfrac{2.00\text{ kW}}{0.84} = 2.38\text{ kW}$.

$P = VI$, ☞ $I = \dfrac{P}{V} = \dfrac{2.38 \times 10^3\text{ W}}{240\text{ V}} = \boxed{9.9\text{ A}}$.

(b) $R = \dfrac{V}{I} = \dfrac{240\text{ V}}{9.9\text{ A}} = \boxed{24\ \Omega}$.

35. (a) The wattage ratings are based on 120 V. $P = \dfrac{V^2}{R}$, ☞ $R = \dfrac{V^2}{P}$.

$R_{15} = \dfrac{(120\text{ V})^2}{15\text{ W}} = 960\ \Omega$, $R_{40} = \dfrac{(120\text{ V})^2}{40\text{ W}} = 360\ \Omega$, $R_{60} = \dfrac{(120\text{ V})^2}{60\text{ W}} = 240\ \Omega$,

and $R_{100} = \dfrac{(120\text{ V})^2}{100\text{ W}} = 144\ \Omega$. So the equivalent resistance is

$R_{eq} = 960\ \Omega + 360\ \Omega + \dfrac{(240\ \Omega)(144\ \Omega)}{240\ \Omega + 144\ \Omega} = 1410\ \Omega$. Therefore $I = \dfrac{V}{R_{eq}} = \dfrac{120\text{ V}}{1410\ \Omega} = \boxed{0.085\text{ A}}$.

(b) $P_{15} = I^2R = (0.0851\text{ A})^2(960\ \Omega) = \boxed{7.0\text{ W}}$, $P_{40} = (0.851\text{ A})^2(360\ \Omega) = \boxed{2.6\text{ W}}$.

$V_{60} = V_{100} = 120\text{ V} - (0.0851\text{ A})(960\ \Omega + 360\ \Omega) = 7.67\text{ V}.$

So $P_{60} = \dfrac{V^2}{R} = \dfrac{(7.67\text{ V})^2}{240\ \Omega} = \boxed{0.24\text{ W}}, \quad P_{100} = \dfrac{(7.67\text{ V})^2}{144\ \Omega} = \boxed{0.41\text{ W}}.$