1a. Recognizing the two voltage dividers: $V_x = 30(\frac{15}{60+15}) - 30(\frac{1}{1+5}) = 1V$.
1b. Generalizing #1a, $V_x = V_S(\frac{15}{60+15} - \frac{1}{1+5}) = V_s/30$.

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2. $V_o = 6 = 18(\frac{R_2}{40+R_2}) \rightarrow R_2 = 20\Omega$. $4 = 18(\frac{R_2||R_L}{40+R_2||R_L}) \rightarrow R_2||R_L = \frac{80}{7}\Omega \rightarrow R_L = \frac{80}{3}\Omega$.

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3. $V_o = 150 = 200(\frac{R_2}{R_1+R_2}) \rightarrow R_2 = 3R_1$.

   $V_o = 100 = 200(\frac{R_2||60k}{R_1+R_2||60k}) \rightarrow R_2||60k = R_1 = R_2/3 \rightarrow R_2 = 120k\Omega \rightarrow R_1 = 40k\Omega$.

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4. Meter resistance$=\frac{10\,mV}{2\,mA} = 5\Omega$. $0.01 = 50(\frac{5}{R_1+5}) \rightarrow R_1 = 24,995\Omega$.

   $0.01 = 100(\frac{5}{R_1+R_2+5}) \rightarrow R_2 = 25k\Omega$ and $0.01 = 200(\frac{5}{R_1+R_2+R_3+5}) \rightarrow R_3 = 50k\Omega$.

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5. Node equation at V_1: $4 = \frac{V_1}{20} + \frac{V_1+60}{80} + \frac{V_1+60}{10+30} \rightarrow V_1 = 20V$.

   Current through 60V is: $4 - \frac{V_1}{20} = 3A$ OR $\frac{V_1+60}{80||(10+30)} = 3A \rightarrow (60V)(3A) = 180W$.

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6. Node equations at V_1 and V_2: $-2.4 = \frac{V_1}{125} + \frac{V_1-V_2}{25}$; $\quad 3.2 = \frac{V_2-V_1}{25} + \frac{V_2}{250} + \frac{V_2}{375}$

   $\rightarrow -300 = 6V_1 - 5V_2$; $\quad 2400 = 35V_2 - 30V_1 \rightarrow V_1 = 25V$; $\quad V_2 = 90V$.

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7. Draw supernode around $V_\Delta/5$: Node eqn.: $\frac{V_o}{78} + \frac{V_o}{39} + \frac{V_o+V_\Delta/5}{30} + \frac{V_o+V_\Delta/5-50}{10} = 0$.

   $V_\Delta = 50 - (V_o + V_\Delta/5) \rightarrow V_\Delta = \frac{125}{3} - \frac{5}{6}V_o \rightarrow V_o + V_\Delta/5 = \frac{25}{3} + \frac{5}{6}V_o \rightarrow V_o = 26V$.

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8. Mesh eqn.: $40 - 3i_a - 45(i_a + i_c) - 2i_a = 0$; $\quad -64 - 4i_c - 45(i_a + i_c) - 1.5i_c = 0 \rightarrow$

   $40 = 50i_a + 45i_c$; $\quad -64 = 45i_a + 50.5i_c \rightarrow i_a = 9.8A; i_c = -10A \rightarrow i_b = -0.2A$.

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9. Let ground=node between sources and X_1, X_2, X_3 be node voltages top to bottom.

   $\frac{X_1-125}{0.2} + \frac{X_1-X_2}{9.4} + \frac{X_1-X_3}{21.2} = \frac{X_2-X_1}{9.4} + \frac{X_2}{0.4} + \frac{X_2-X_3}{19.4} = \frac{X_3-X_1}{21.2} + \frac{X_3-X_2}{19.4} + \frac{X_3+125}{0.2} = 0$

   Rewrite: $\begin{bmatrix} 5.1536 & -0.1064 & -0.0472 \\ -0.1064 & 2.6579 & -0.0515 \\ -0.0472 & -0.0515 & 5.0987 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} 625 \\ 0 \\ -625 \end{bmatrix} \rightarrow \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} 120.2 \\ 2.469 \\ -121.4 \end{bmatrix}$.

   $v_1 = X_1 - X_2 = 117.8V$; $\quad v_2 = X_2 - X_3 = 123.9V$; $\quad v_3 = X_1 - X_3 = v_1 + v_2 = 241.7V$