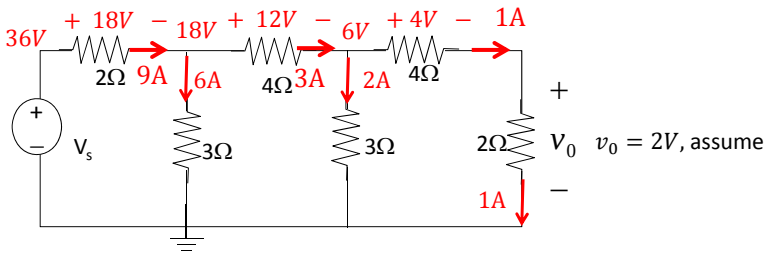
R12

Practice 1: Find v_0 for V_s=27V by linearity



$v_0 = 2V$, assume

Step 1: Find k such that v_0=kV_s by assuming v_0= some value

Assume $v_0 = 2V, \rightarrow \ V_s = 36V$

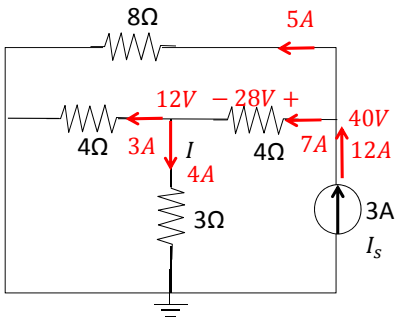
$2 = k\ 36, \qquad k = \frac{1}{18} \qquad v_0 = \frac{1}{18} V_s$

Step 2: For V_s=27V, v_0= k V_s

$$v_0 = \frac{1}{18}\ 27 = 1.5V$$

R12

Practice 2: Find I using linearity



Input: I_s
Output: I

Need to find k such that $I = kI_s$

Assign the ground

$Assume\ I = 4A$

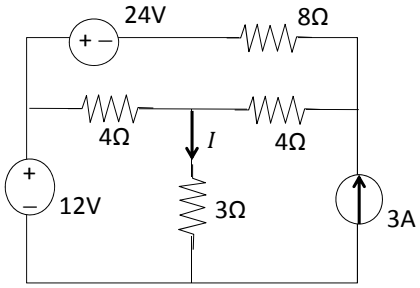
$I_s = 12A$

$$k = \frac{I}{I_s} = \frac{4}{12} = \frac{1}{3}$$

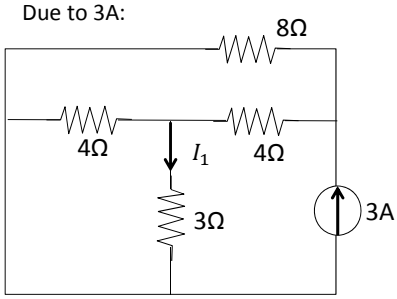
$$I = \frac{1}{3} I_s$$

For $I_s = 3A,\ I = \frac{1}{3} \times 3 = 1A$

Practice 3: Find I using superposition.

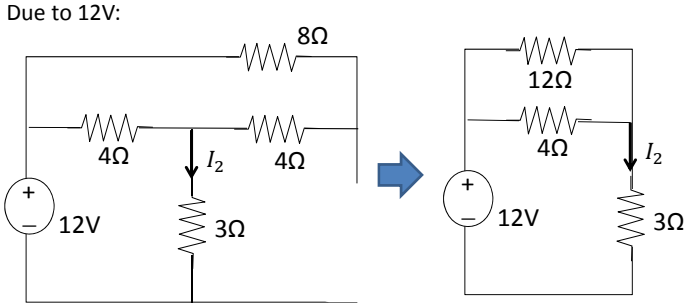


Due to 3A:



From previous slide, $I_1 = 1A$

Due to 12V:



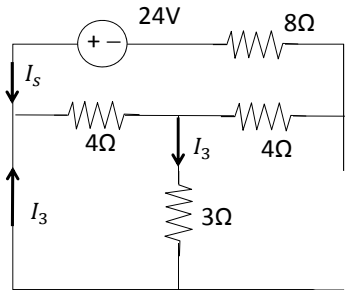
$R_{eq}\ w.r.t\ 12V$

$R_{eq} = 3 + 4//12$

=6Ω

$I_2 = 2A$

Due to 24V:



$R_{eq}\ w.r.t\ 24V$

$R_{eq} = 8 + 4 + 4//3$

=96/7

$$I_s = 24 \times \frac{7}{96} = \frac{7}{4}A$$

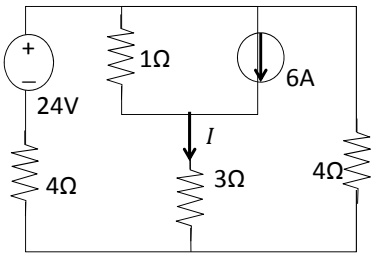
By current division:

$$I_3 = -\frac{4}{7} \times I_s = -1A$$

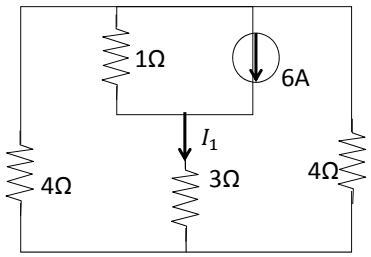
Finally: $I = I_1 + I_2 + I_3 = 1 + 2 - 1 = 2A$

R12

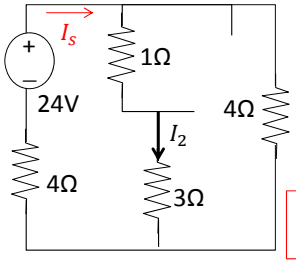
Practice 4: Find I using superposition.



Due to 6A:



Due to 24V



$R_{eq}\ w.r.t\ 24V$

$R_{eq} = 4 + 4//4$

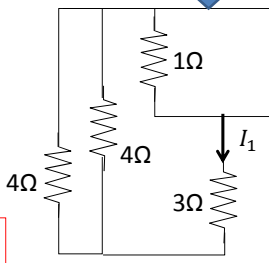
$=6\Omega$

$I_s = \frac{24}{6} = 4A$

$I_2 = 2A$

$I = I_1 + I_2$

$= 2 + 1 = 3A$



6A divided by $1\Omega\ and\ 3+4//4$

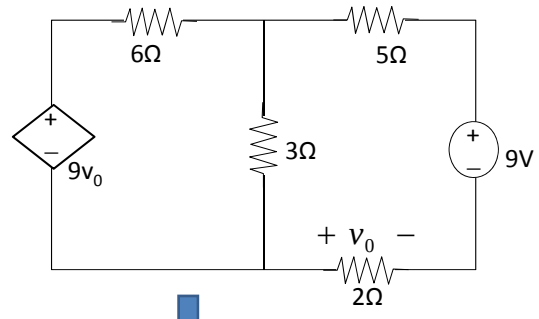
By current Division

$I_1 = \frac{1}{1+5} \times 6$

$= 1A$

R13

Practice 5: Find v_0 using source transformation



Assign loop current I

$v_0 = 2I$

By KVL along counter clockwise direction

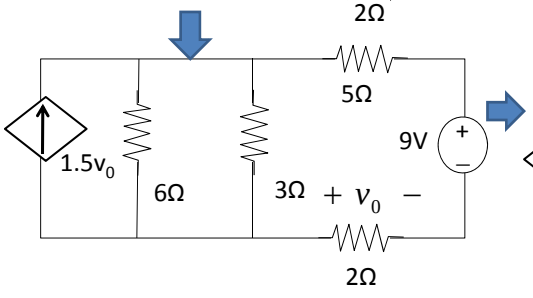
$5I + 2I + 3v_0 + 2I = 9$

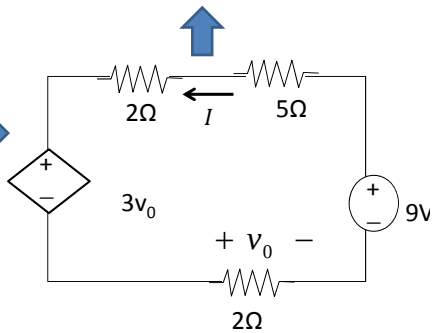
$9I + 3v_0 = 9$

$9I + 3(2I) = 9;$

$I = \frac{9}{15} = 0.6A$

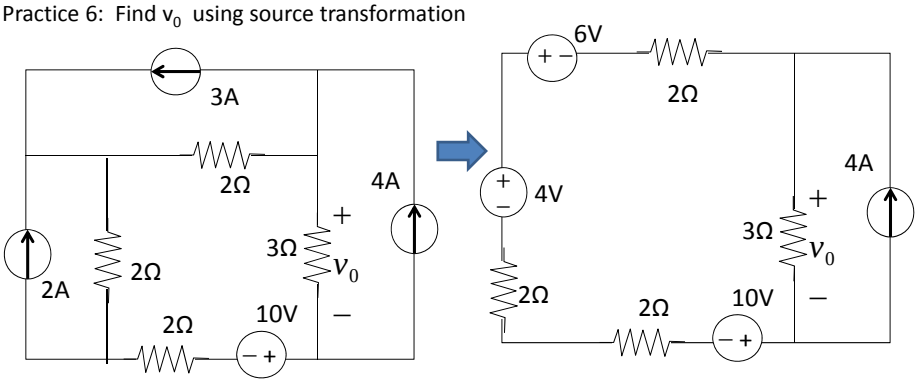
$v_0 = 1.2V$





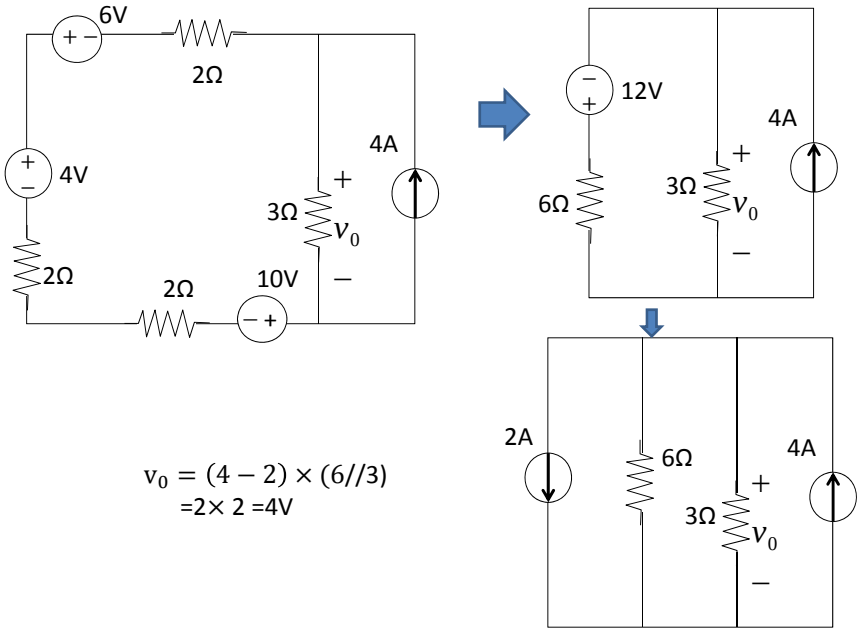
R13

Practice 6: Find v_0 using source transformation



R13

Approach 1:

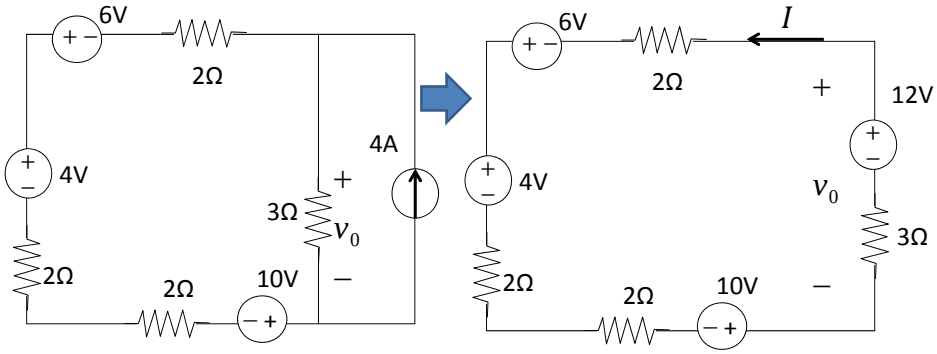


$v_0 = (4-2) \times (6//3)$

=2× 2 =4V

R13

Approach 2:



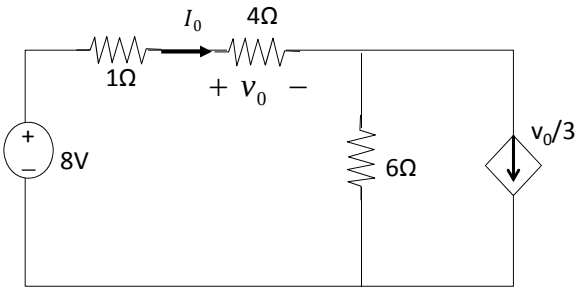
Assign loop current I

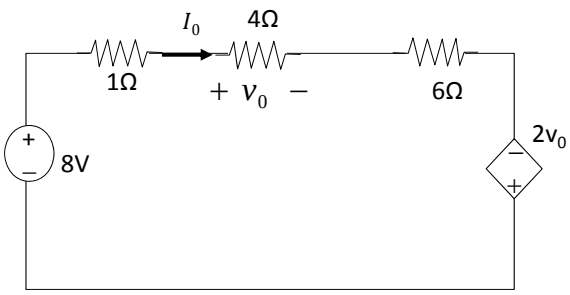
$$I = \frac{12 + 6 - 4 + 10}{9} = \frac{24}{9} = \frac{8}{3}A$$

$$v_0 = 12 - 3I = 4V$$

R13

Practice 7: Find I_0 using source transformation





$v_0 = 4I_0$

KVL clockwise

$$I_0 + v_0 + 6I_0 - 2v_0 = 8$$

$$7I_0 - v_0 = 8$$

$$7I_0 - 4I_0 = 8$$

$$I_0 = \frac{8}{3}A$$