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

Step 1: Find $k$ such that $v_0=kV_s$ by assuming $v_0=\text{some value}$

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

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

Step 2: For $V_s=27V$, $v_0 = kV_s$

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

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:

Due to 12V:

Due to 24V:

Finally: $I = I_1 + I_2 + I_3 = 1 + 2 - 1 = 2A$
Practice 4: Find $I$ using superposition.

Due to 6A:

$$R_{eq} \text{ w.r.t } 24V$$
$$R_{eq} = 4 + 4/4 = 6\Omega$$
$$I_s = \frac{24}{6} = 4A$$
$$I_2 = 2A$$

$$I = I_1 + I_2$$
$$= 2 + 1 = 3A$$

Due to 24V

$$R_{eq} \text{ w.r.t } 24V$$
$$R_{eq} = 4 + 4/4 = 6\Omega$$

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

Practice 5: Find $v_0$ using source transformation

Assign loop current $l$

$$v_0 = 2I$$

By KVL along counter clockwise direction

$$5I + 2I + 3v_0 + 2I = 9$$
$$9I + 3v_0 = 9$$
$$9I + 3(2I) = 9;$$
$$l = \frac{9}{15} = 0.6A$$
$$v_0 = 1.2V$$
Practice 6: Find $v_0$ using source transformation

Approach 1:

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

Assign loop current $I$

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

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

Practice 7: Find $I_0$ using source transformation

$$v_o = 4I_0$$

KVL clockwise

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

$$7I_0 - v_0 = 8$$

$$7I_0 - 4I_0 = 8$$

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