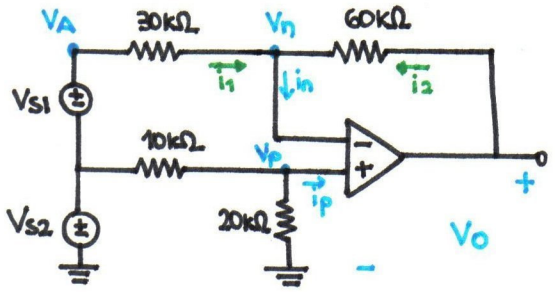
EXAMPLE 1



$V_n = V_p$
$i_n = i_p = 0$

Find v_o in terms of the inputs v_{s1} and v_{s2}

$i_p = 0 \quad \Rightarrow \quad V_p = \frac{2}{3} V_{s2}$ (VOLTAGE DIVISION RULE)

$V_n = V_p = \frac{2}{3} V_{s2}$

$V_A = V_{s1} + V_{s2}$

$i_1 + i_2 = i_n = 0 \quad \Rightarrow$

$$\frac{V_A - V_n}{30k} + \frac{V_o - V_n}{60K} = 0$$

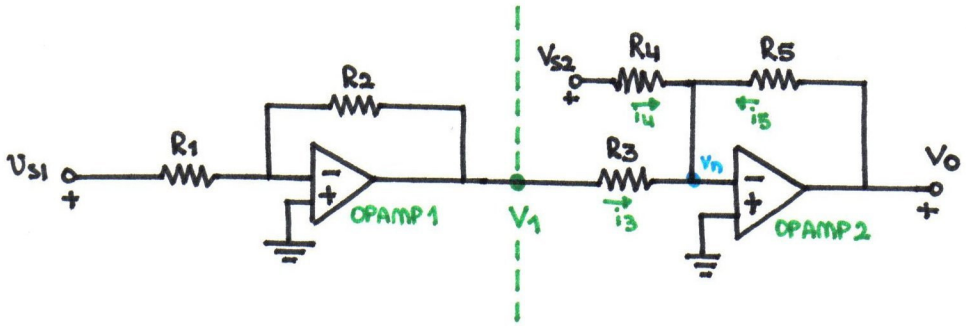
$V_A = V_{s1} + V_{s2}$
$V_n = \frac{2}{3} V_{s2}$

$$2\left(V_{s1} + V_{s2} - \frac{2}{3}V_{s2}\right) + \left(V_o - \frac{2}{3}V_{s2}\right) = 0$$

$$2V_{s1} + 2\left(\frac{1}{3}V_{s2}\right) + V_o - \frac{2}{3}V_{s2} = 0$$

$$\boxed{V_o = -2V_{s1} + 0\,V_{s2}}$$

EXAMPLE 2



Find v_o in terms of the inputs v_{s1} and v_{s2}

OPAMP 1

$$V_p = V_n = 0$$

$$\frac{V_{s1}}{R_1} + \frac{V_1}{R_2} = 0$$

$$V_1 = -\frac{R_2}{R_1} V_{s1}$$

OPAMP 2

$$V_p = V_n = 0$$

$$i_n = 0 \quad \Rightarrow \quad i_3 + i_4 + i_5 = 0$$

$$\frac{V_1 - \overset{V_n=0}{\cancel{V_n}}}{R_3} + \frac{V_{s2} - \overset{V_n=0}{\cancel{V_n}}}{R_4} + \frac{V_o - \overset{V_n=0}{\cancel{V_n}}}{R_5} = 0$$

$$V_o = -\frac{R_5}{R_3} V_1 - \frac{R_5}{R_4} V_{s2}$$

$$= -\frac{R_5}{R_3}\left(-\frac{R_2}{R_1} V_{s1}\right) - \frac{R_5}{R_4} V_{s2}$$

$$\boxed{V_o = \frac{R_2 R_5}{R_1 R_3} V_{s1} - \frac{R_5}{R_4} V_{s2}}$$