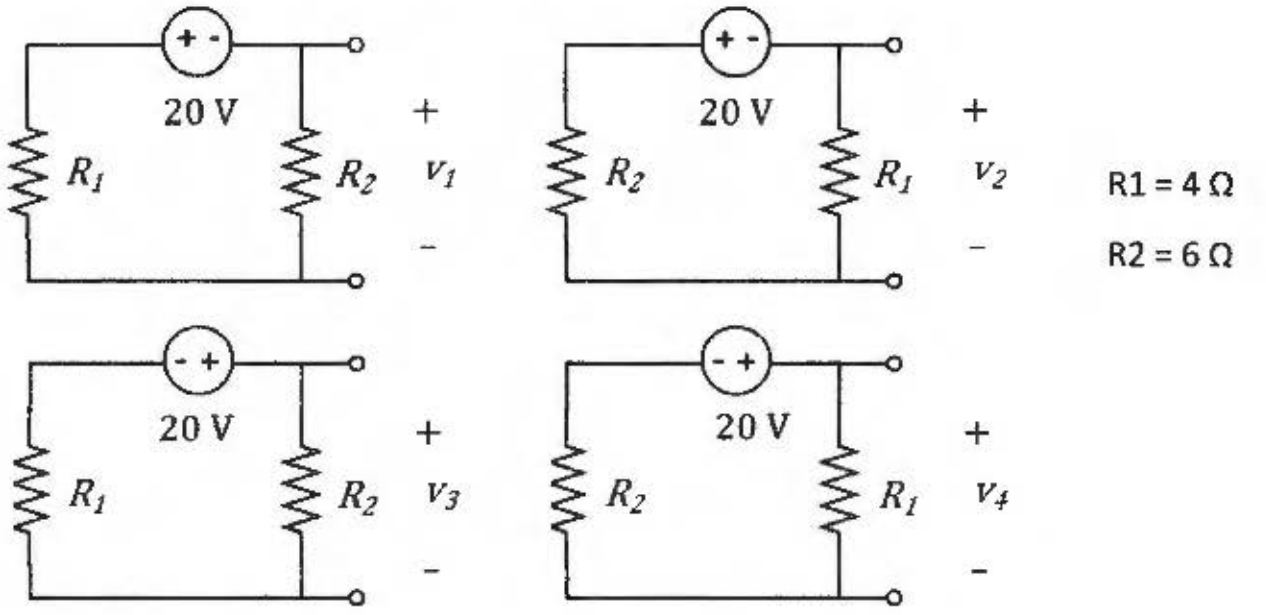
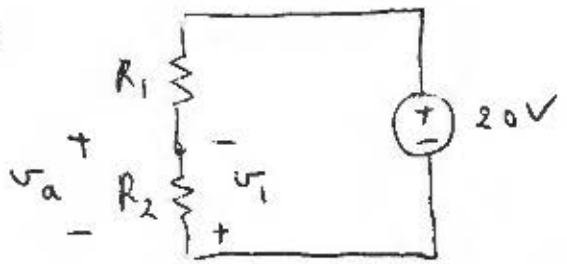
Determine the voltages v_1, v_2, v_3 and v_4



(a) VOLTAGE DIVIDER



$$V_a = 20 \cdot \frac{R_2}{R_1 + R_2} = 20 \, \frac{6}{10} = 12 \text{ V}$$

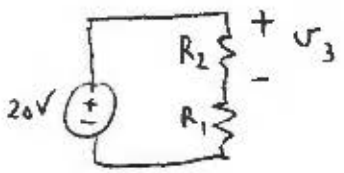
$V_1 = -V_a$

$\boxed{V_1 = -12 \text{ V}}$

(b) SAME IDEA : $V_2 = -20 \cdot \frac{R_1}{R_1 + R_2} = -20 \cdot \frac{4}{10} = -8$

$\boxed{V_2 = -8 \text{ V}}$

(c)



$$V_3 = 20 \cdot \frac{R_2}{R_1 + R_2} = 20 \cdot \frac{6}{10} = 12$$

$\boxed{V_3 = 12 \text{ V}}$

(d) $$V_4 = 20 \cdot \frac{R_1}{R_1 + R_2} = 20 \, \frac{4}{10} = 8$$

$\boxed{V_4 = 8 \text{ V}}$