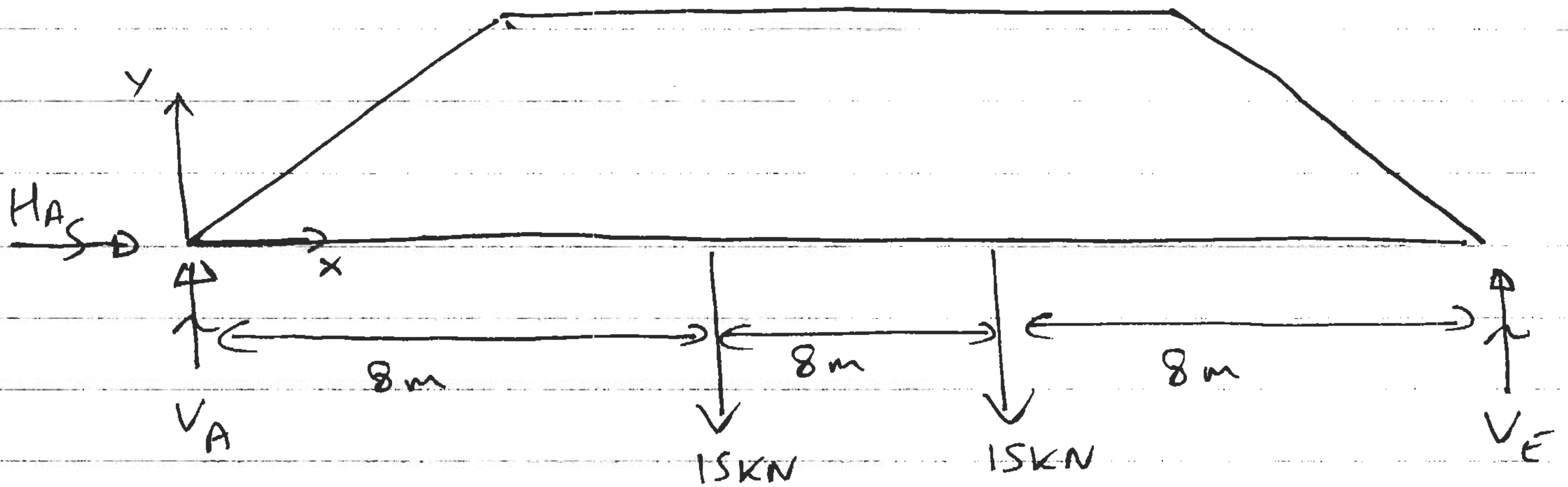


M4

a)

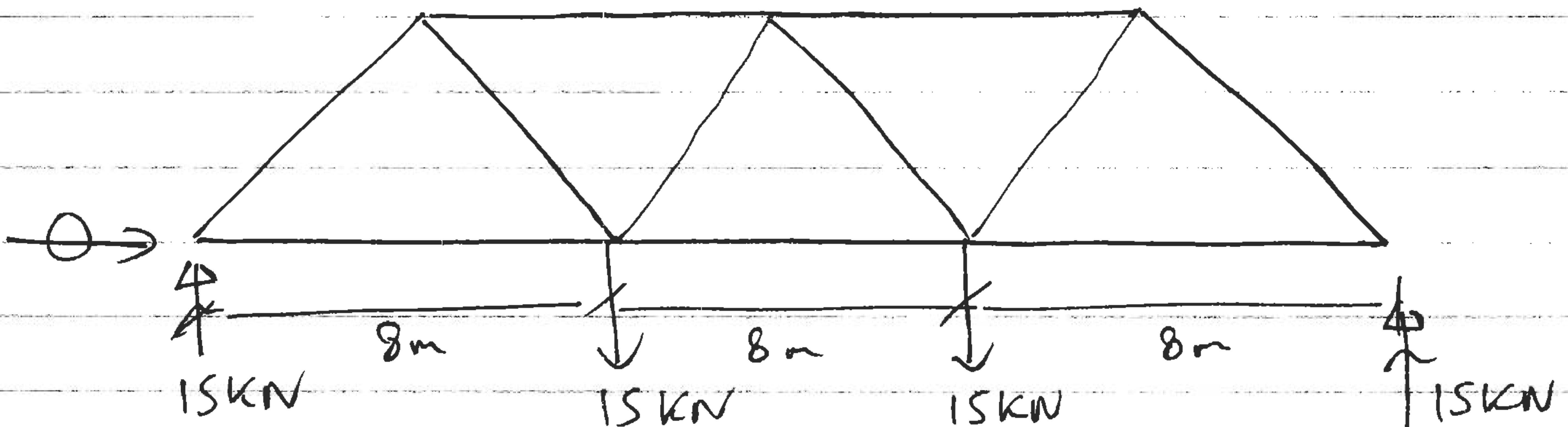


$$\sum F_x = 0: H_A + 0 = 0 \Rightarrow H_A = 0$$

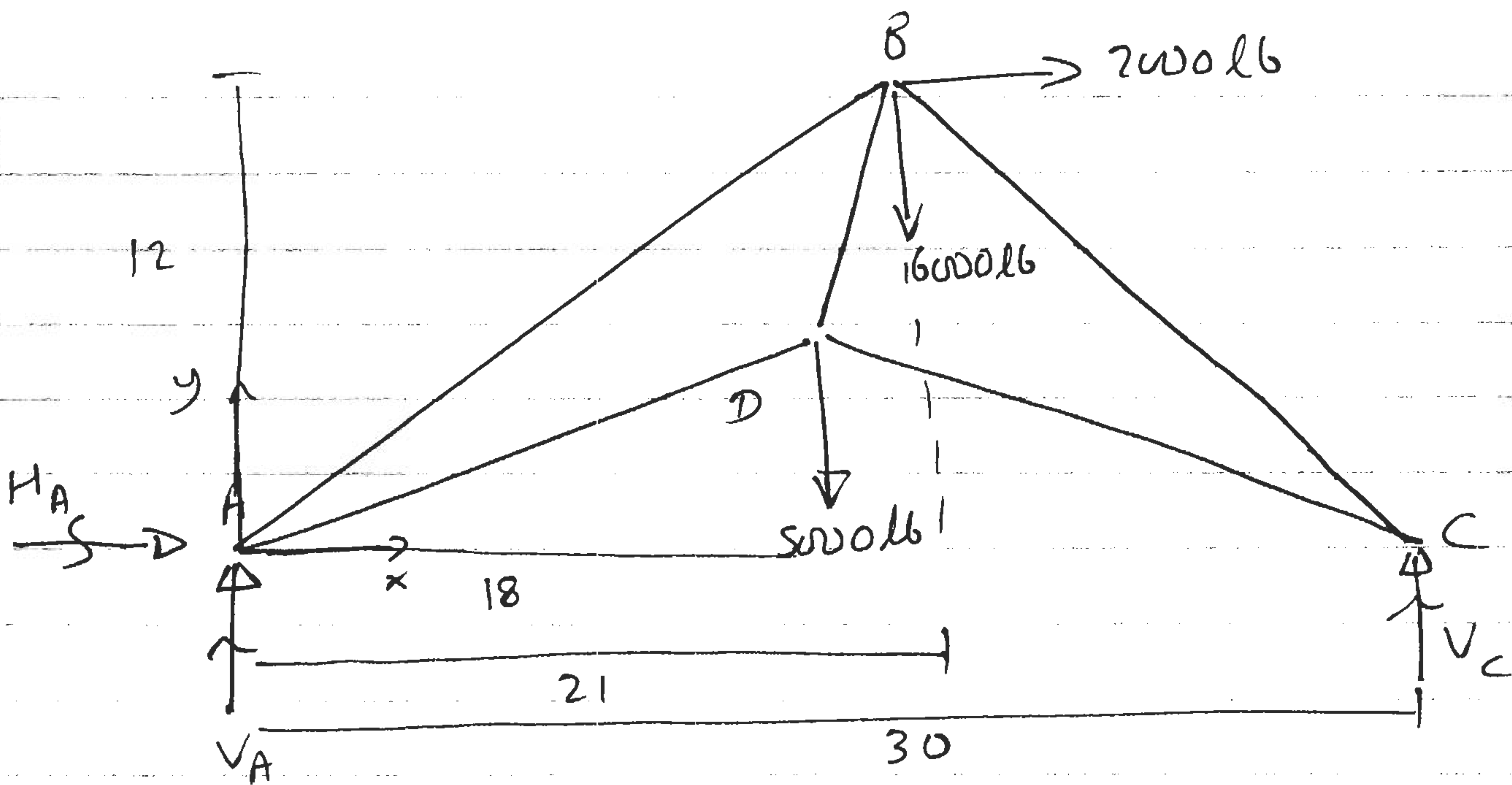
$$\sum F_y \uparrow = 0: V_A + V_E - 30 = 0 \Rightarrow V_A + V_E - 30 = 0$$

$$\sum M_A = 0: -15 \times 8 - 15 \times 16 + 24 V_E = 0$$

$$\therefore V_A = 15 \text{ kN} \quad \left. \begin{array}{l} = V_E = 15 \text{ kN} \\ \end{array} \right\} \begin{array}{l} \text{must be equal} \\ \text{by symmetry} \end{array}$$



6)



$$\sum \vec{F}_x = 0: H_A + 2000 = 0 \Rightarrow H_A = -2000 \text{ lb} \Leftarrow$$

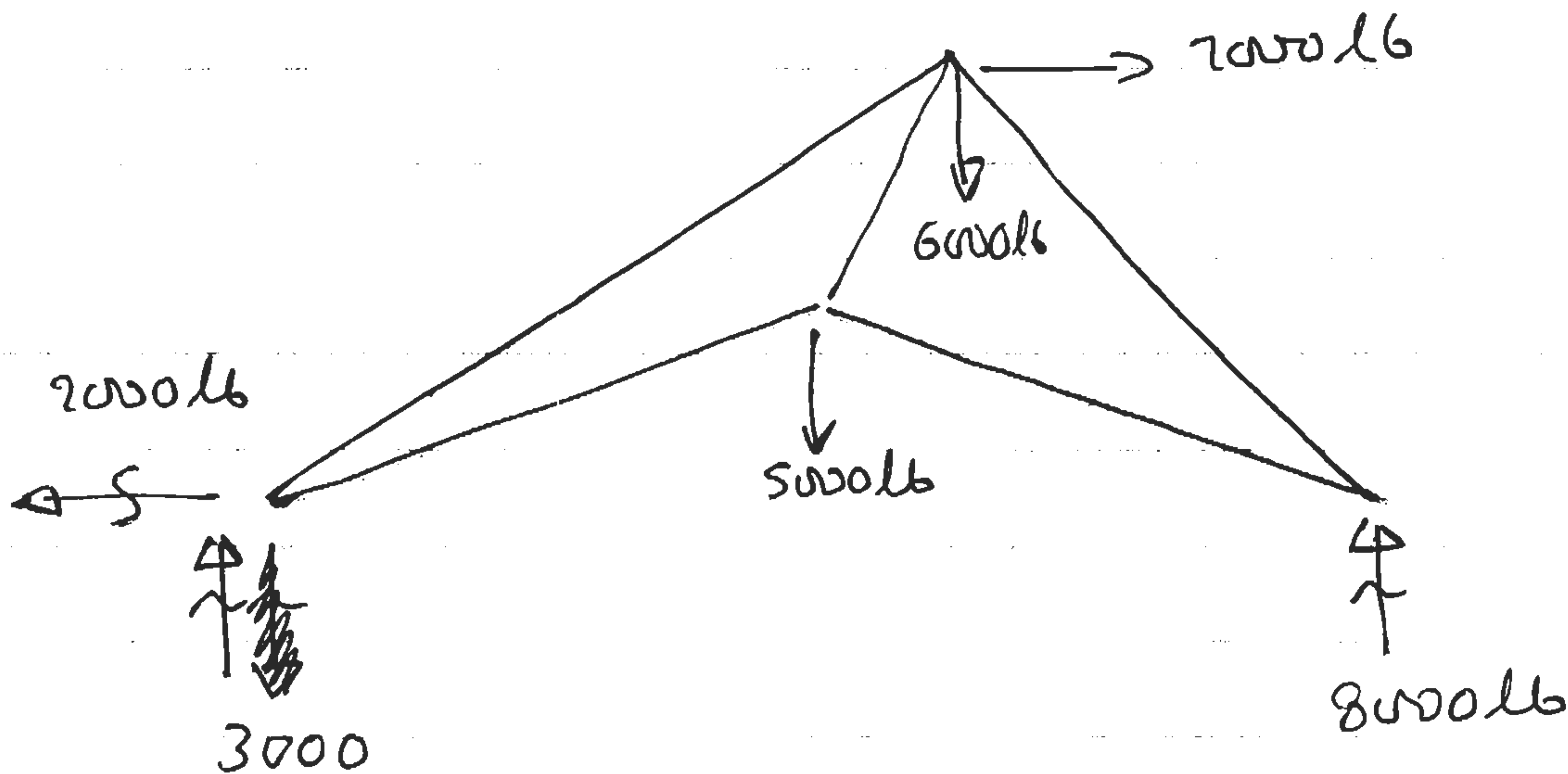
(i.e. in opposite direction to initial assumption)

$$\sum F_y = 0: V_A - 5000 - 6000 + V_C = 0$$

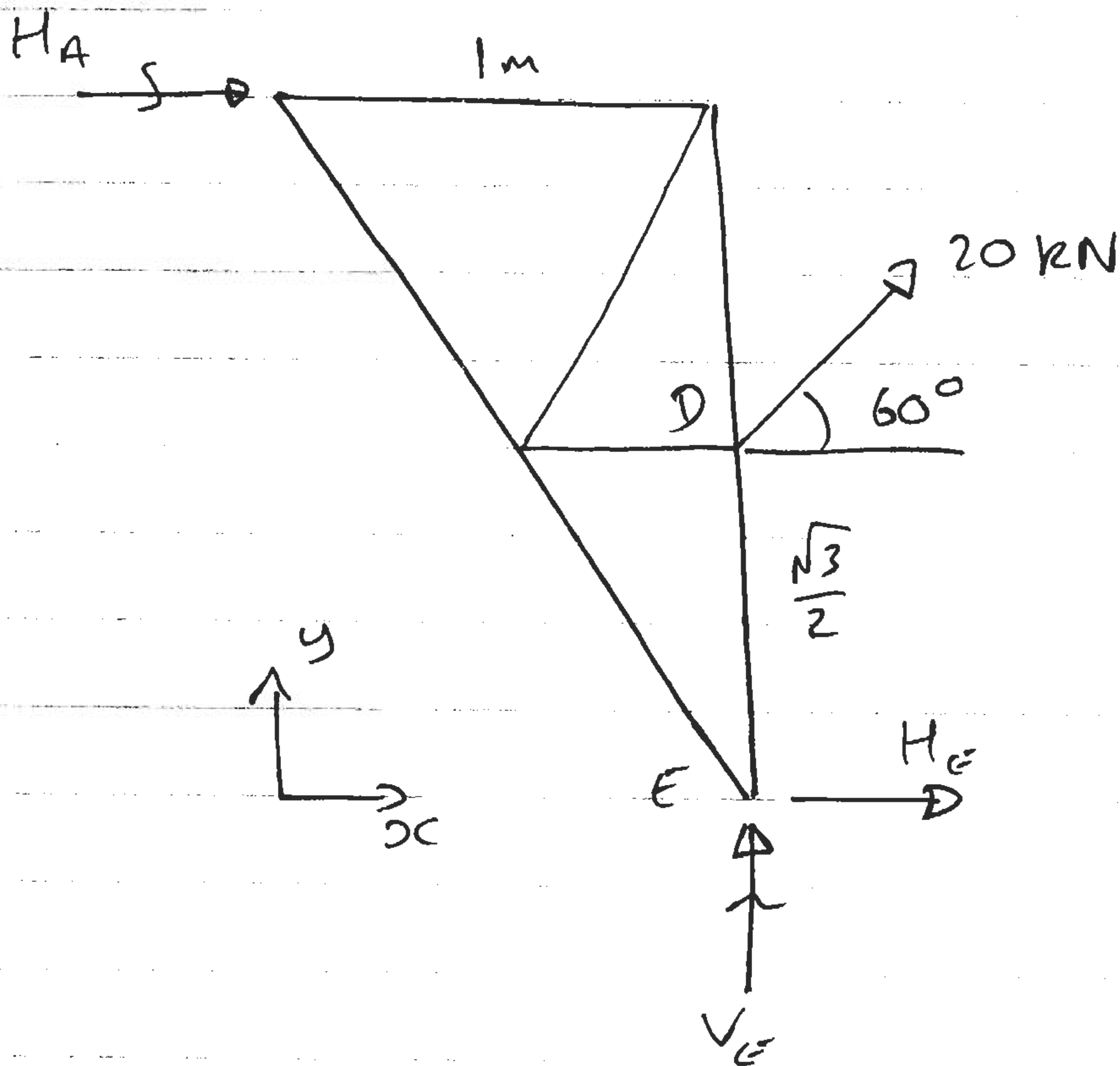
$$\sum M_A = 0: -18 \times 5000 - 21 \times 6000 - 12 \times 2000 + V_C \times 30 = 0$$

$$\Rightarrow V_C = 8000 \text{ lb} \Leftarrow$$

$$\therefore V_A = +3000 \text{ lb} \quad \text{~~in opposite direction~~}$$



M9 c)



$$\sum \vec{F}_x = 0: \quad H_A + H_E + 20 \cos 60^\circ = 0$$

$$H_A + H_E + 10 = 0$$

$$\sum F_y \uparrow = 0: \quad V_E + 20 \sin 60^\circ = 0$$

$$V_E + 20 \frac{\sqrt{3}}{2} = 0 \Rightarrow V_E = -20 \frac{\sqrt{3}}{2} \text{ kN}$$

$$\sum (M_D = 0) \quad \left. \begin{array}{l} \text{eliminates} \\ \text{force of } 20 \text{ kN, } V_E \end{array} \right\} \quad H_E \frac{\sqrt{3}}{2} - H_A \frac{\sqrt{3}}{2} = 0$$

$$\therefore H_E = H_A \Rightarrow H_A = H_E = -5 \text{ kN}$$

