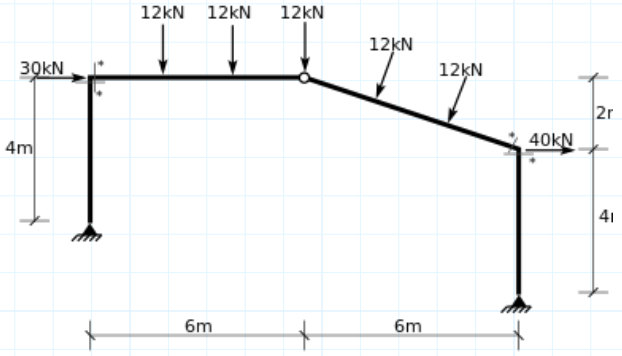
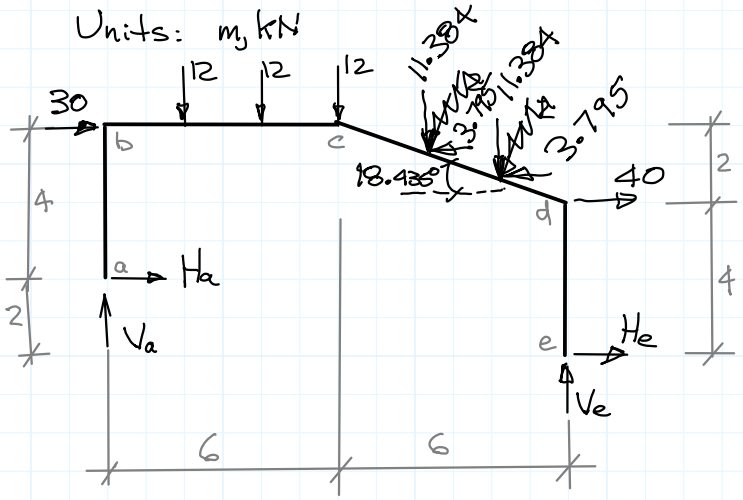
Problem 2.7-6 (Partial)



Units: m, kN



FBD-1

$\tan^{-1}\frac{2}{6} = 18.435°$

$12\cos 18.435° = 11.384$

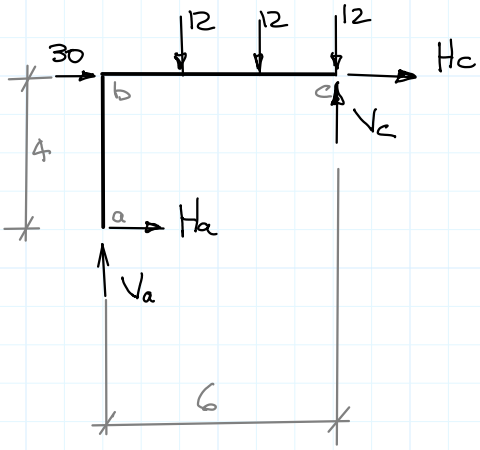
$12\sin 18.435° = 3.795$

From FBD-1:

$\Sigma M_e = 0$ (+↺)

$$-V_a\times 12 - H_a\times 2 + 12\times 10 + 12\times 8 + 12\times 6 + 11.384\times 4 + 11.384\times 2 + 3.795\times\left(4+\tfrac{2}{3}\right) + 3.795\times\left(4+2\times\tfrac{2}{3}\right) - 40\times 4 - 30\times 6 = 0$$

1) $6V_a + H_a = 27.127$



FBD-2
Part a-b-c

From FBD-2

$\Sigma M_c = 0$ (+↺)

$$-V_a\times 6 + H_a\times 4 - 30\times 0 + 12\times 4 + 12\times 2 = 0$$

2) $-1.5V_a + H_a = -18$

1)-2) $7.5V_a = 45.127$

$V_a = 6.017$ (∴ ↑)

2) $-1.5\times 6.017 + H_a = -18$

$H_a = -8.974$ (∴ ←)

From FBD-1:

$\Sigma F_x = 0$ (+→)

$H_a + H_e + 30 + 40 - 3.795 - 3.795 = 0$

$-8.974 + H_e + 62.41 = 0$

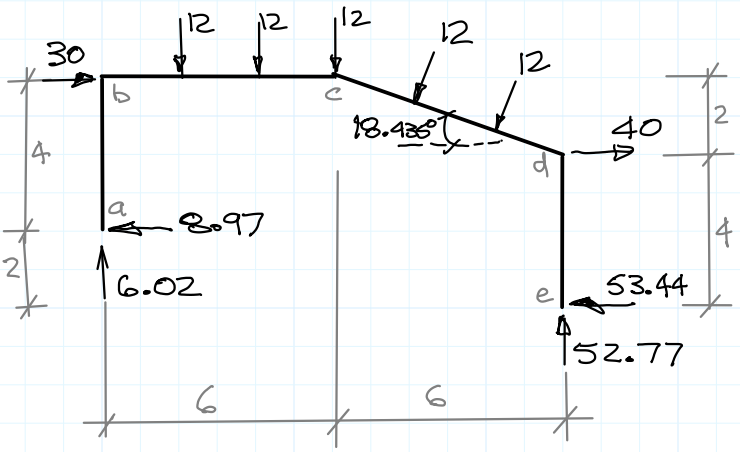
$H_e = -53.44$ (∴ ←)

$\Sigma F_y = 0$ (+↑)

$V_a + V_e - 3\times 12 - 2\times 11.384 = 0$

$6.017 + V_e - 58.768 = 0$

$V_e = 52.768$ (∴ ↑)



Units: m, kN

Check $\sum M_d$ (+)

$-6.02 \times 12 - 8.97 \times 2$
$-30 \times 2 + 12 \times 10 + 12 \times 8$
$+12 \times 6 + 12 \times 6.325 \times \frac{2}{3}$
$+ 12 \times 6.325 \times \frac{1}{3}$
-53.44×4
$= -0.04$ Ok!

FBD-3 Summary

$L_{cd} = \sqrt{2^2 + 6^2} = 6.325\,m$