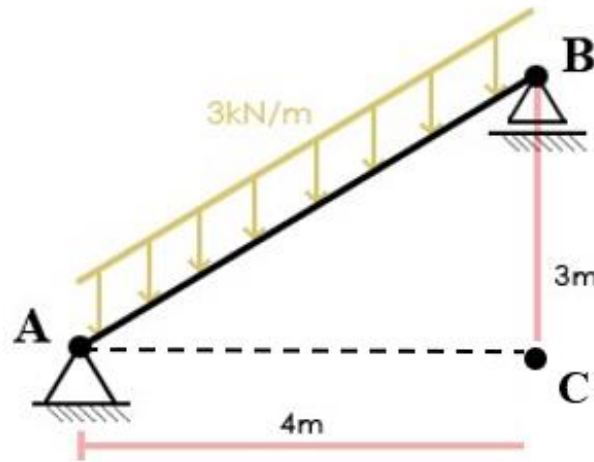
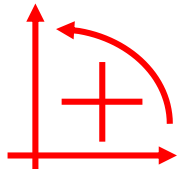


PEF3208
Aula 7
3 abr
PROF. NAKAO

EXERCÍCIO 1. DETERMINAR AS REAÇÕES DOS APOIOS E ESBOÇAR O DIAGRAMA DOS ESFORÇOS SOLICITANTES NA ESTRUTURA DA FIGURA

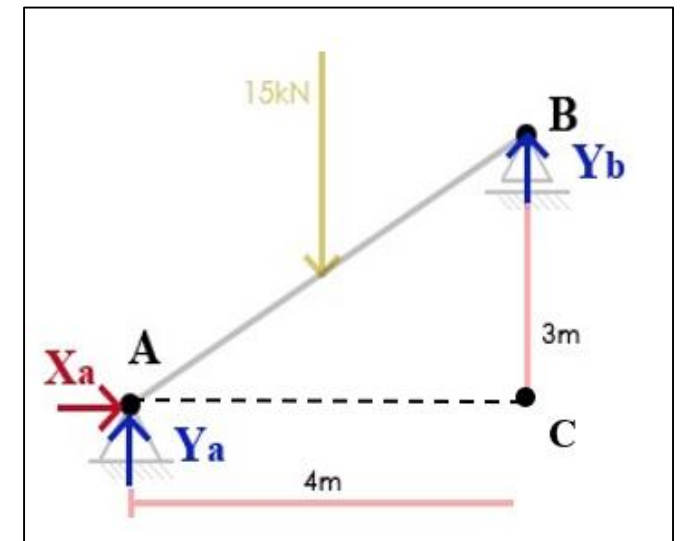


Convenção
para o equilíbrio:
GRINTER

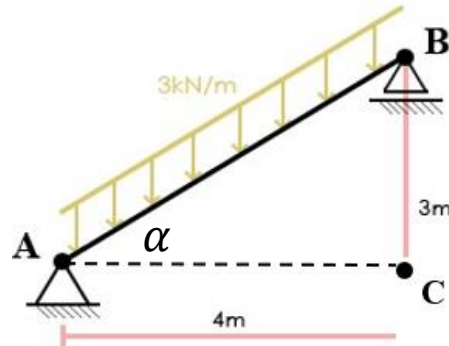
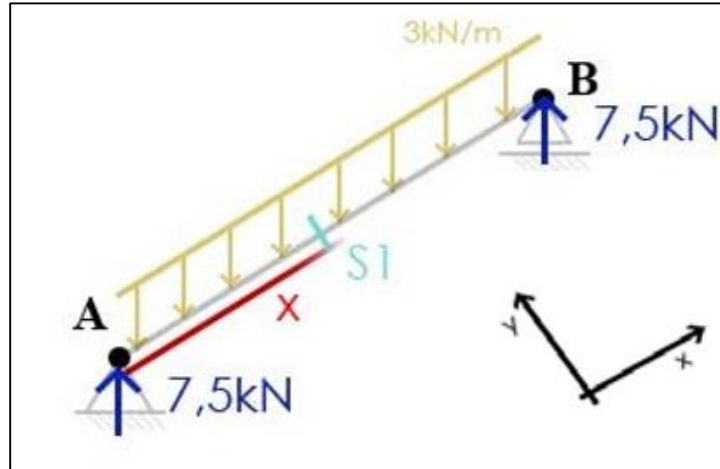


1. REAÇÕES NOS APOIOS

- $\Sigma F_H = 0 = X_a \Rightarrow X_a = 0$
- $\Sigma M_{(A)} = 0 = -15 \cdot 2 + Y_b \cdot 4$
 $\Rightarrow Y_b = 7,5 \text{ kN}$
- $\Sigma M_{(C)} = 0 = -Y_a \cdot 4 + 15 \cdot 2$
 $\Rightarrow Y_a = 7,5 \text{ kN}$



2. DIAGRAMA DO CORPO LIVRE



$$\text{sen } \alpha = \frac{3}{5} = 0,6$$

$$\text{cos } \alpha = \frac{4}{5} = 0,8$$

3. SEÇÃO S1

$$\Sigma X = 0 = N(x) + 7,5 \text{sen } \alpha - 3x \cdot \text{sen } \alpha$$

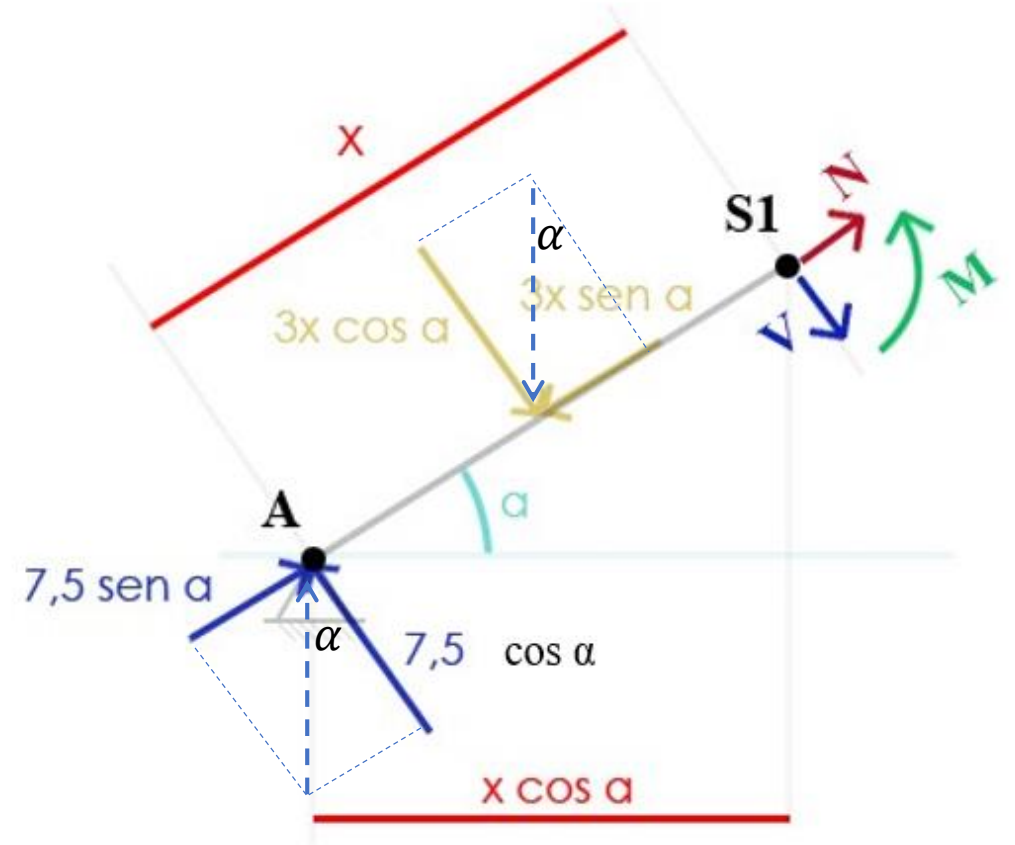
$$\Rightarrow N(x) = -4,5 + 1,8x$$

$$\Sigma Y = 0 = 7,5 \cdot \text{cos } \alpha - 3x \cdot \text{cos } \alpha - V(x)$$

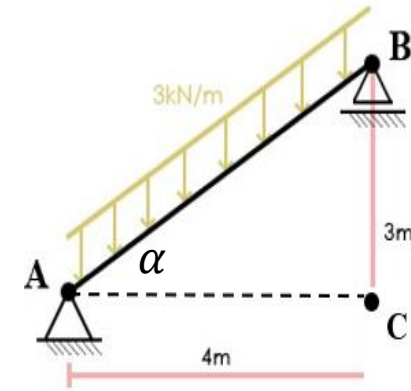
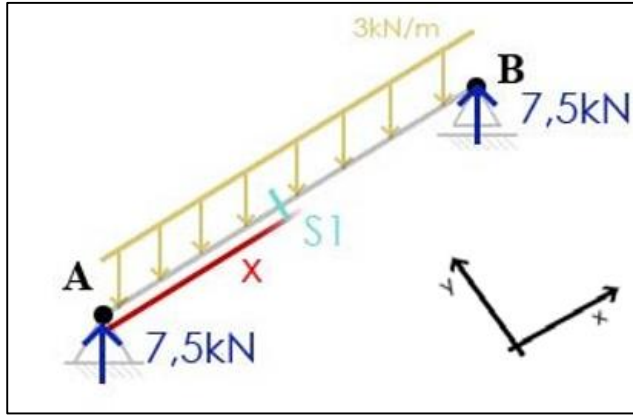
$$\Rightarrow V(x) = 6 - 2,4x$$

$$\Sigma M_{(S1)} = 0 = (-7,5 \cdot \text{cos } \alpha) \cdot x + (3x \cdot \text{cos } \alpha) \cdot \frac{x}{2} + M(x)$$

$$\Rightarrow M(x) = 6x - 1,2x^2$$

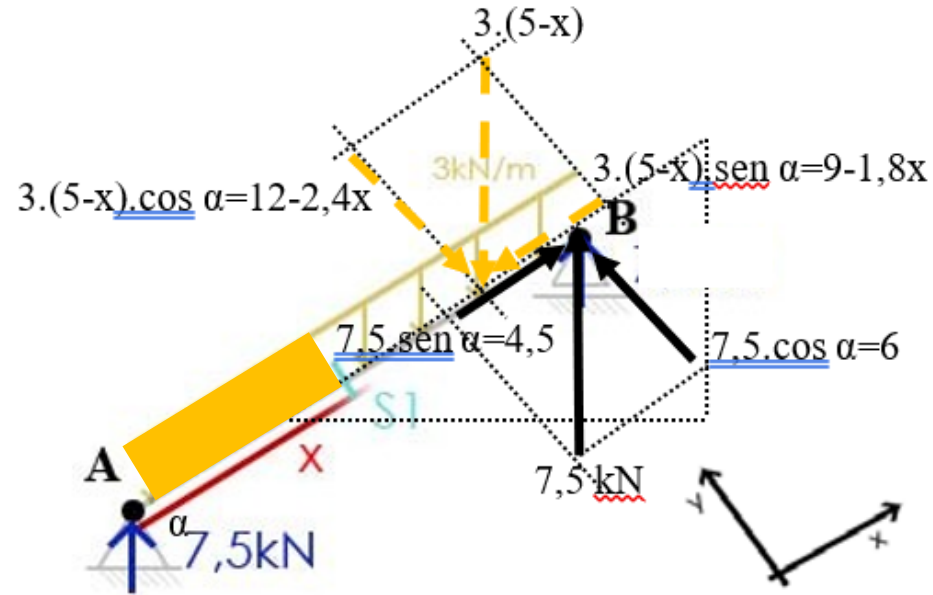


3. SEÇÃO S1



$$\text{sen } \alpha = \frac{3}{5} = 0,6$$

$$\text{cos } \alpha = \frac{4}{5} = 0,8$$



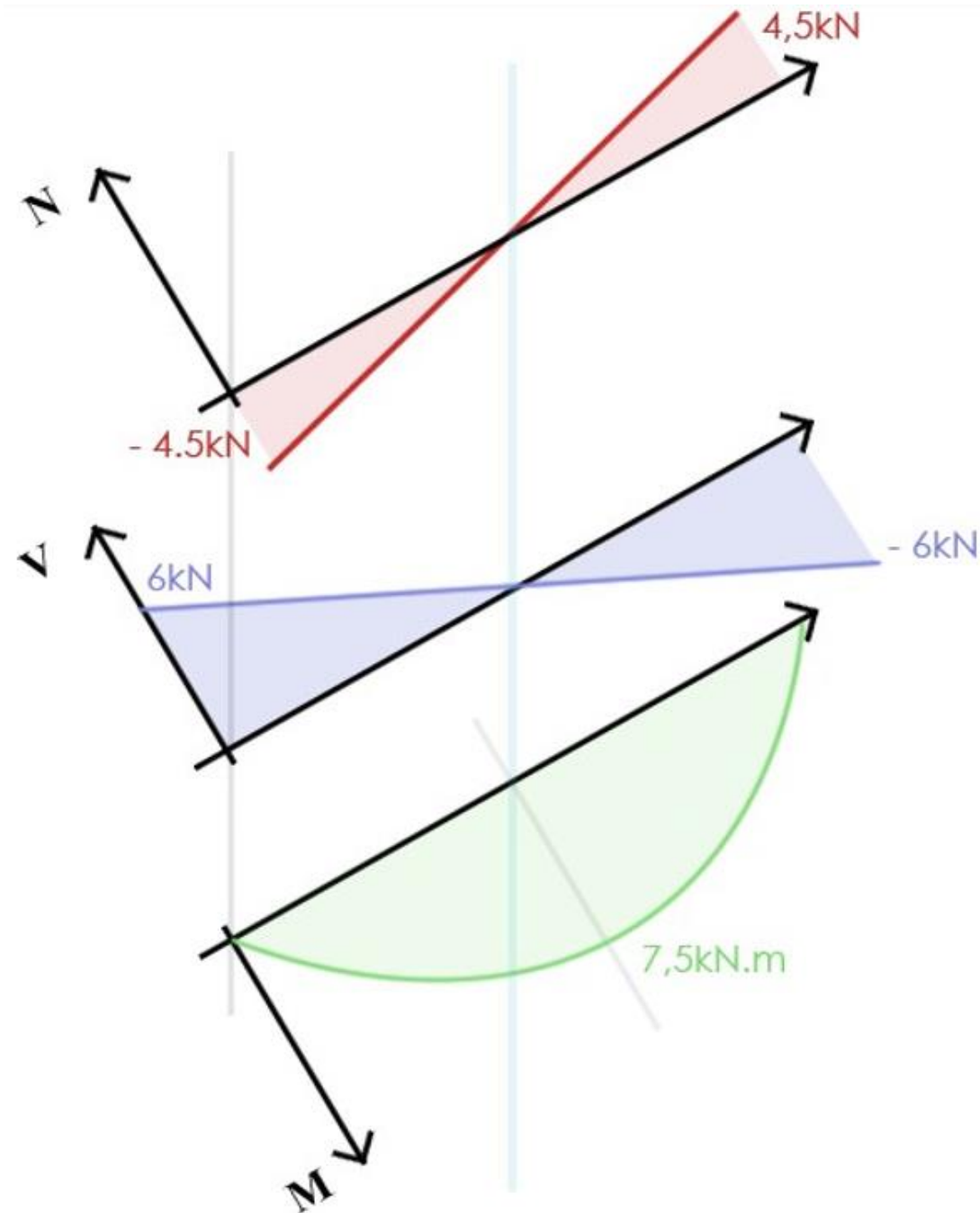
$$N(x) = 4,5 - (9 - 1,8x) = -4,5 + 1,8x$$

$$M(x) = 6 \cdot (5 - x) - (12 - 2,4x) \cdot (5 - x) / 2 = 6x - 1,2x^2$$

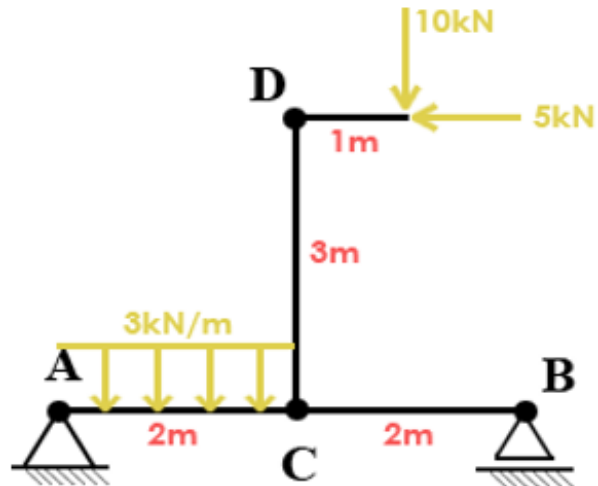
$$V(x) = (12 - 2,4x) - 6 = 6 - 2,4x$$

4. DIAGRAMAS DOS ESFORÇOS SOLICITANTES

- $N(x) = -4,5 + 1,8x$
 - $N(0) = -4,5 \text{ kN}$
 - $N(5) = 4,5 \text{ kN}$
- $V(x) = 6 - 2,4x$
 - $V(0) = 6 \text{ kN}$
 - $V(5) = -6 \text{ kN}$
- $M(x) = 6x - 1,2x^2$
 - $M(0) = 0$
 - $M(5/2) = 7,5 \text{ kN.m}$
 - $M(5) = 0$



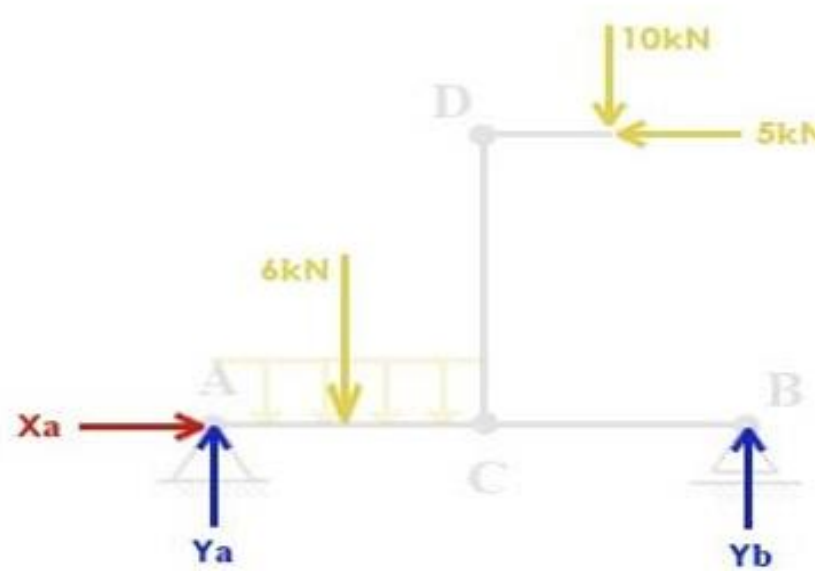
EXERCÍCIO 2. DETERMINAR AS REAÇÕES DOS APOIOS E ESBOÇAR O DIAGRAMA DOS ESFORÇOS SOLICITANTES NA VIGA POLIGONAL



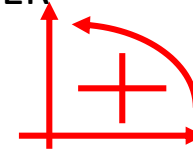
A (articulação fixa)
 B (articulação móvel)
 C, D (engastamentos)

1. REAÇÕES NOS APOIOS

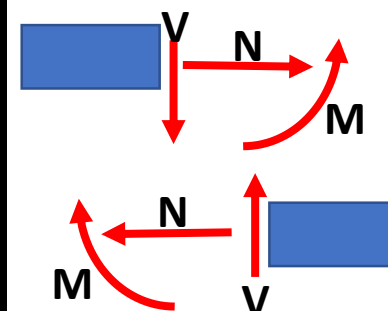
- $\Sigma F_H = 0 = X_a - 5$
 $\Rightarrow X_a = 5 \text{ kN}$
- $\Sigma M_{(A)} = 0 = -6 \cdot 1 - 10 \cdot 3 + 4Y_b + 5 \cdot 3$
 $\Rightarrow Y_b = 5,25 \text{ kN}$
- $\Sigma M_{(B)} = 0 = -4Y_a + 6 \cdot 3 + 10 \cdot 1 + 5 \cdot 3$
 $\Rightarrow Y_a = 10,75 \text{ kN}$



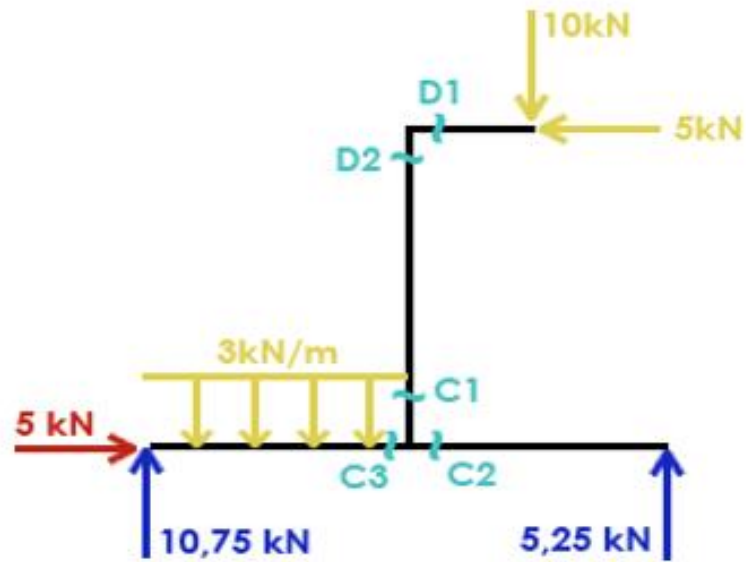
Convenção
 para o equilíbrio:
 GRINTER



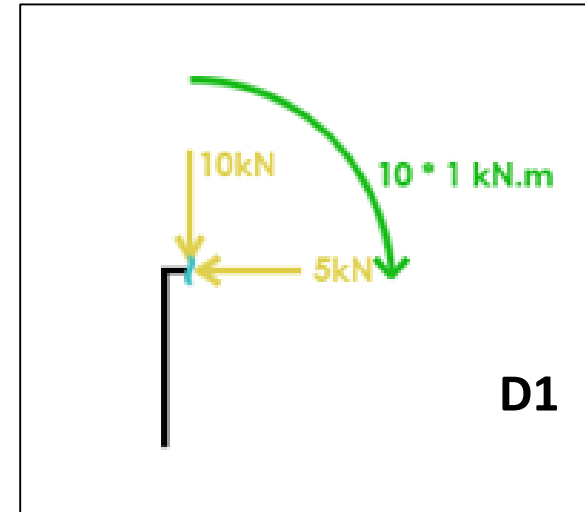
Convenção
 para esforços
 solicitantes: +



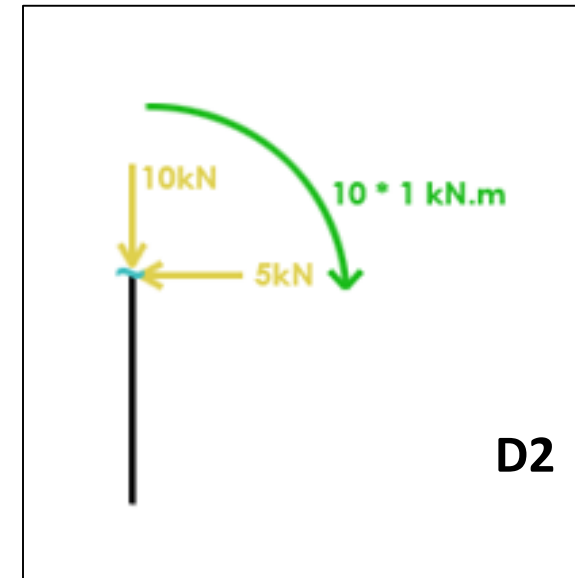
2. DIAGRAMA DO CORPO LIVRE



3. SEÇÃO D1 E SEÇÃO D2

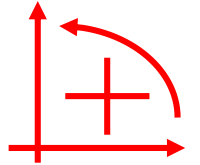


D1

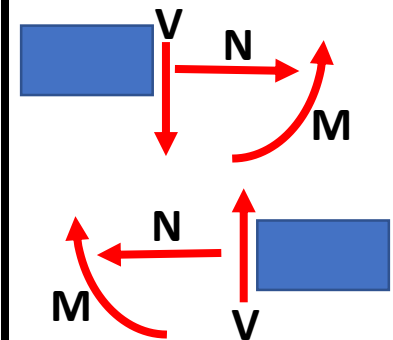


D2

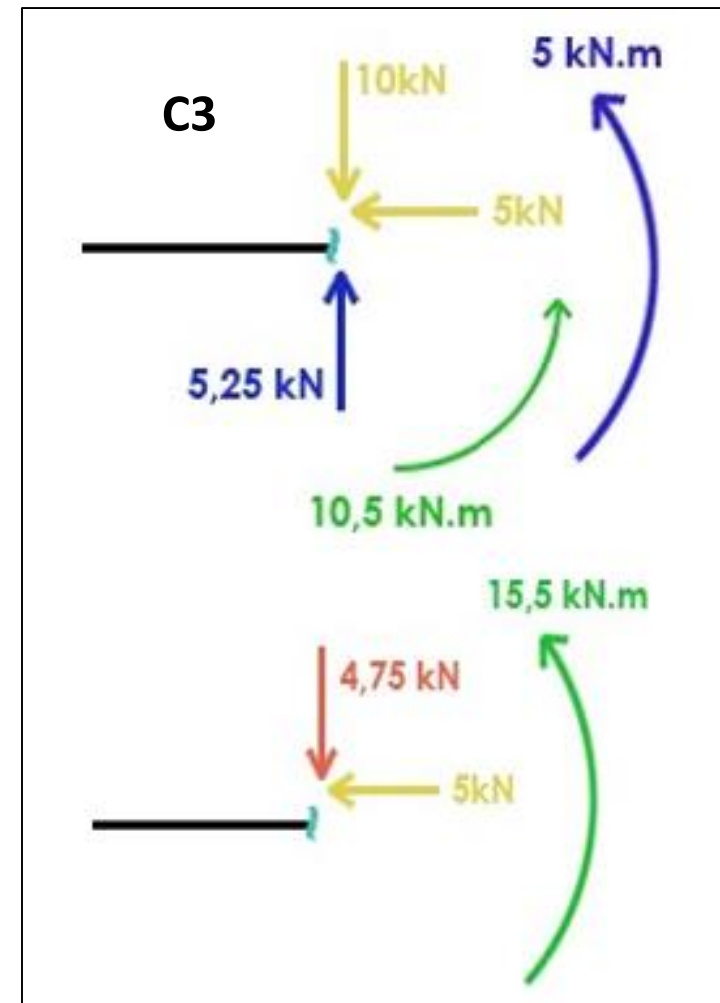
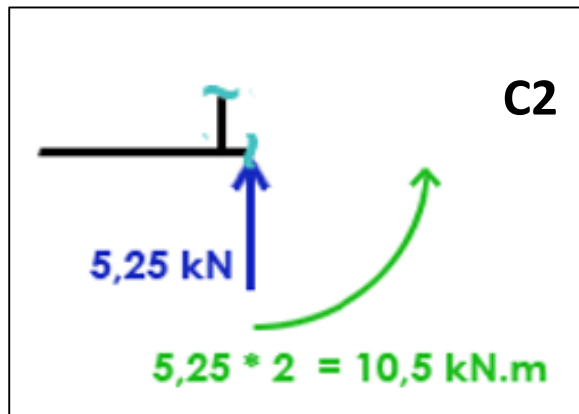
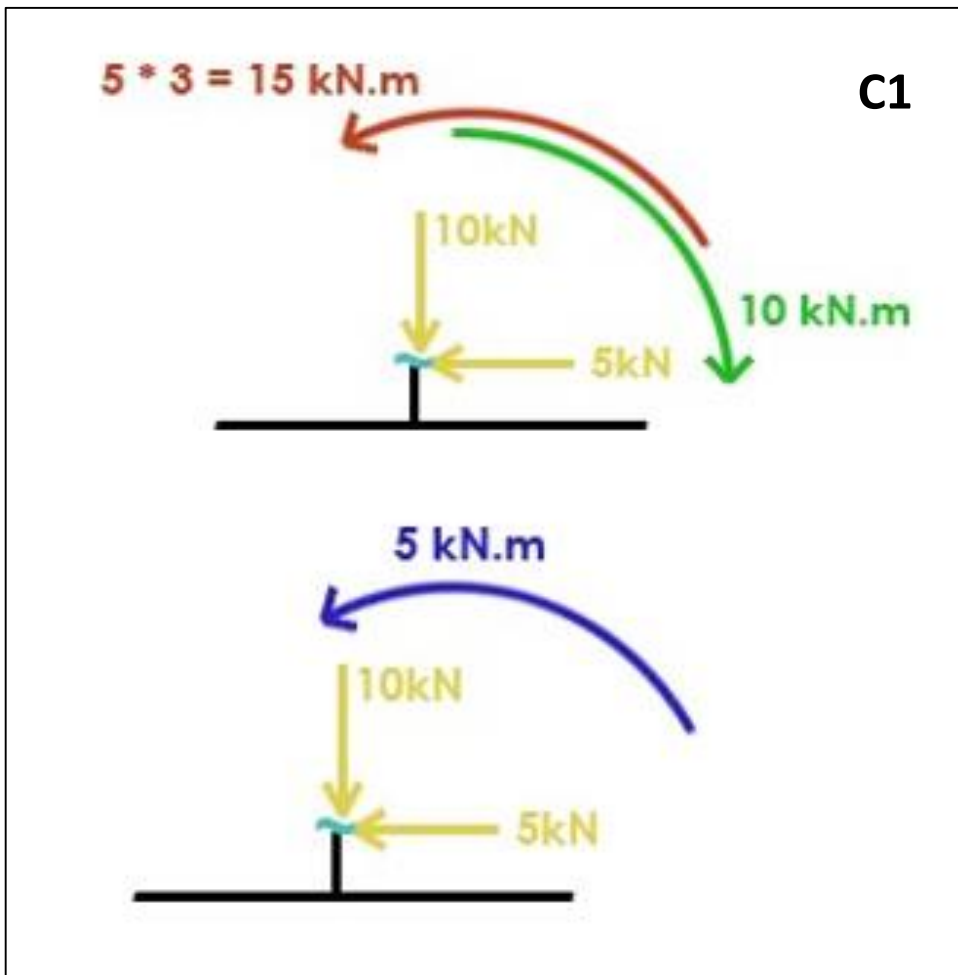
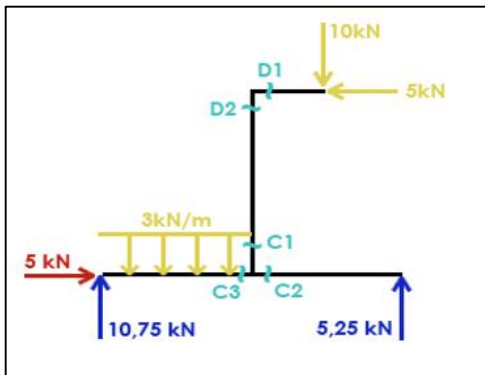
Convenção para o equilíbrio: GRINTER



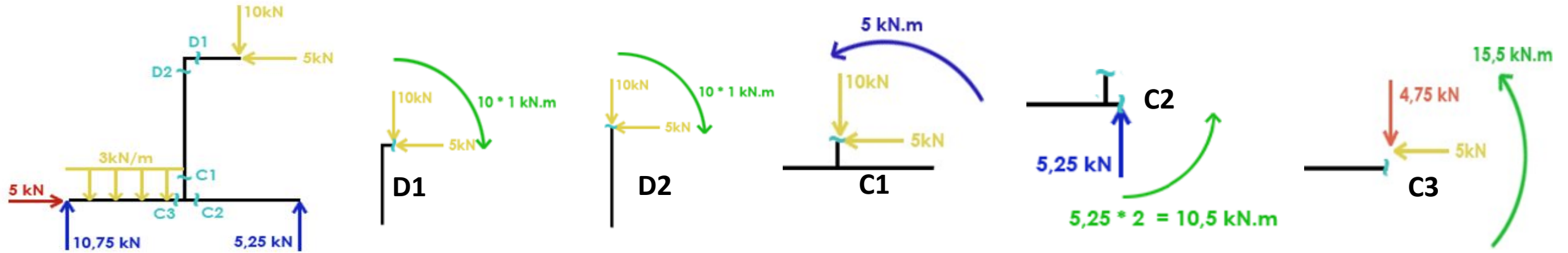
Convenção para esforços sollicitantes: +



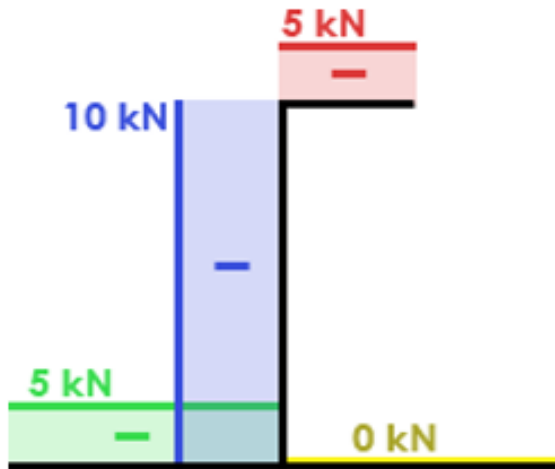
4. SEÇÃO C1, SEÇÃO C2 E SEÇÃO C3



5. DIAGRAMAS DOS ESFORÇOS SOLICITANTES



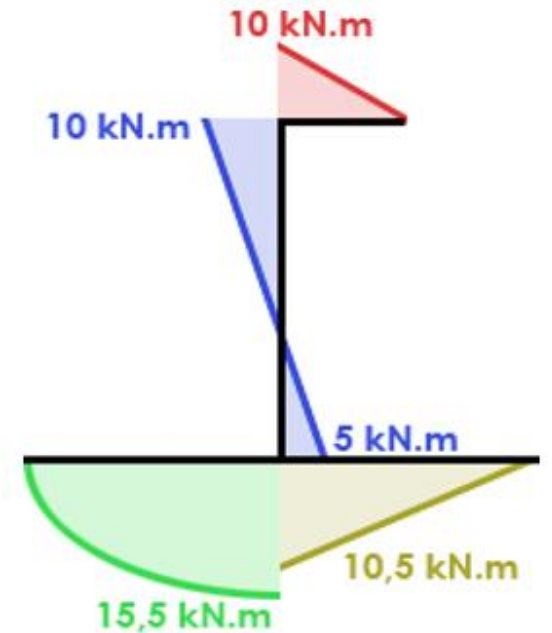
Normal:



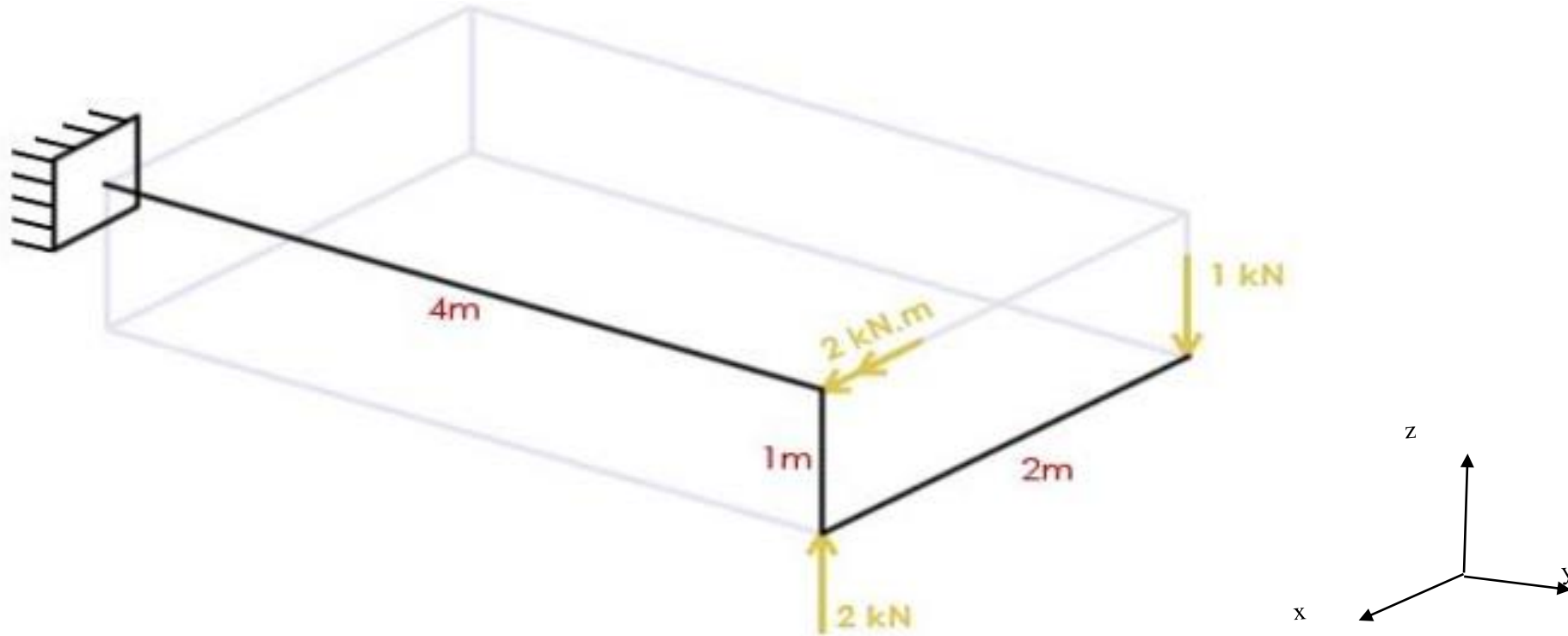
Cortante:



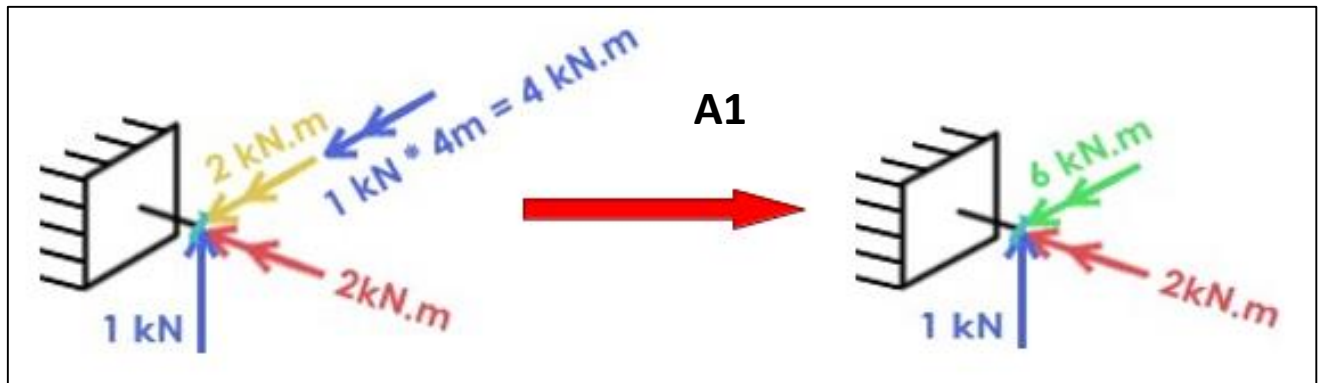
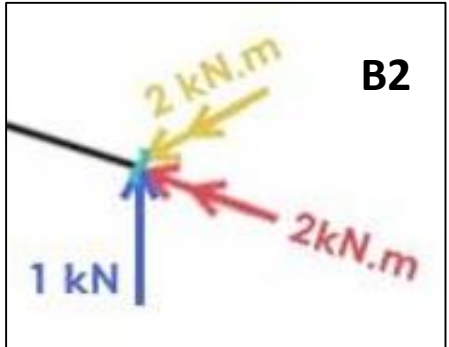
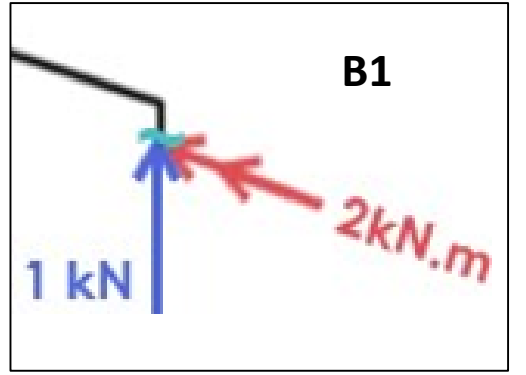
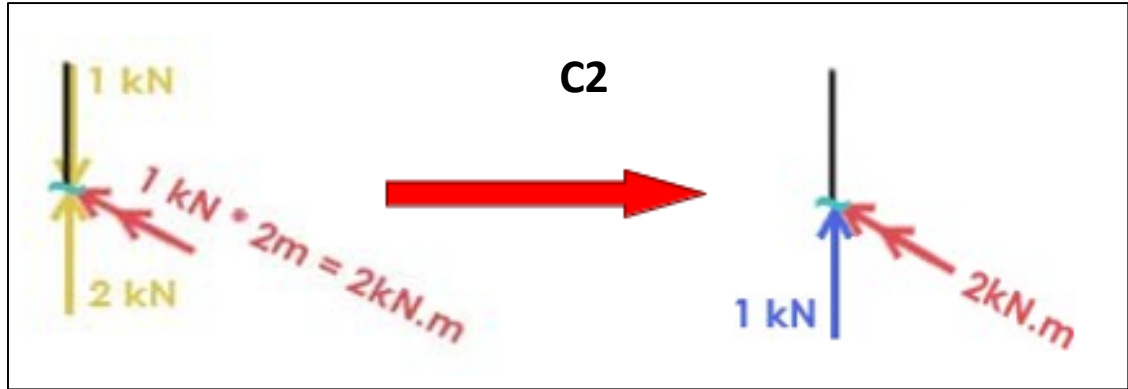
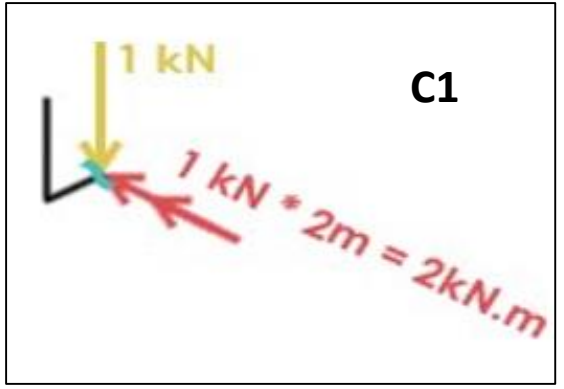
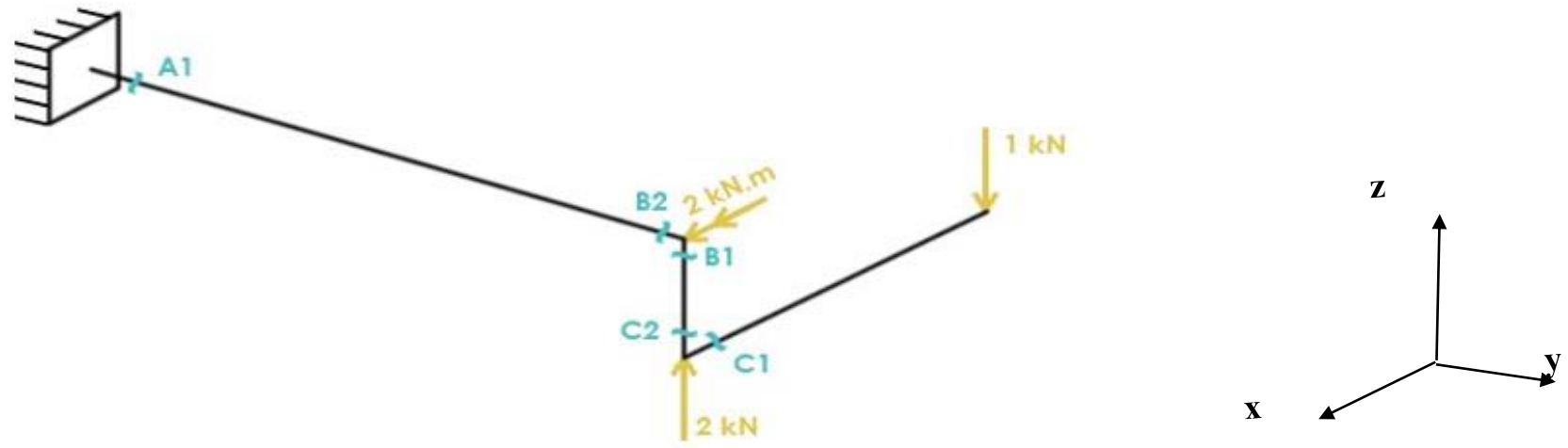
Momento fletor:



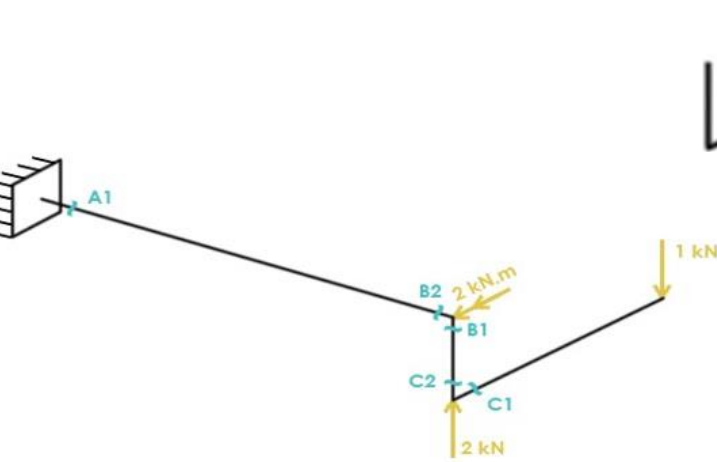
EXERCÍCIO 3. ESBOÇAR O DIAGRAMA DOS ESFORÇOS SOLICITANTES NA ESTRUTURA ESPACIAL



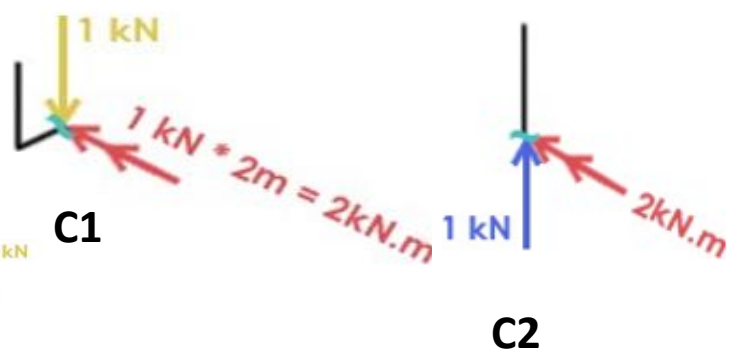
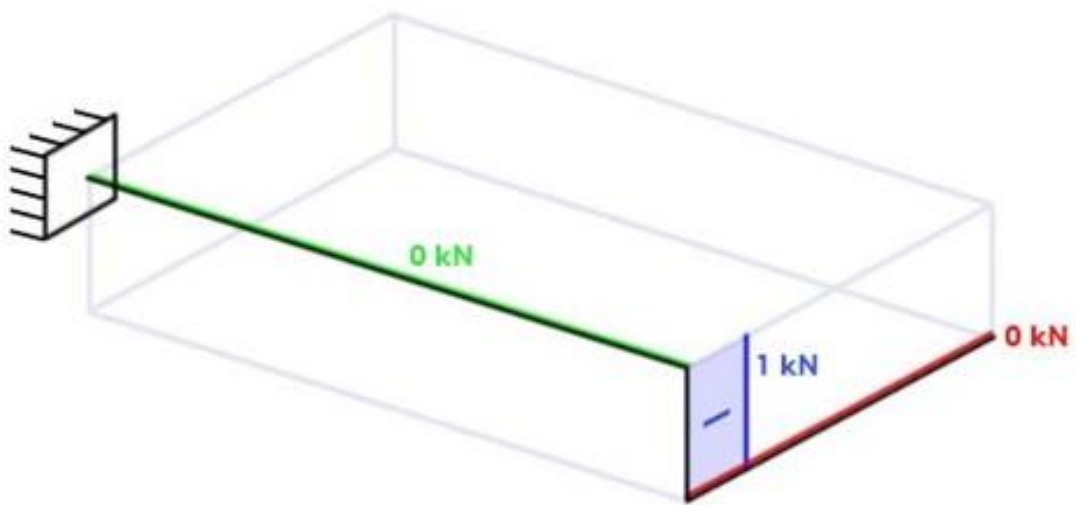
TEOREMA DO CORTE: SEÇÕES C1, C2, B1, B2, A1



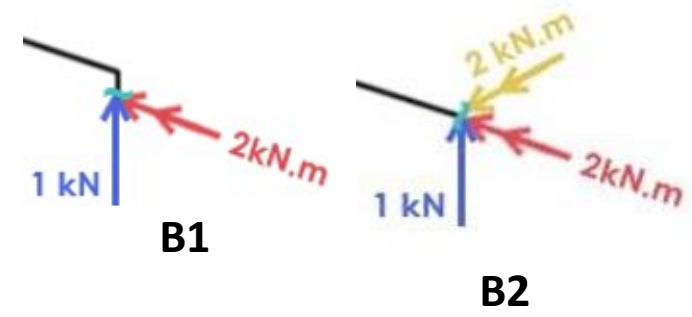
DIAGRAMAS DOS ESFORÇOS SOLICITANTES: FORÇA NORMAL E FORÇA CORTANTE



FORÇA NORMAL

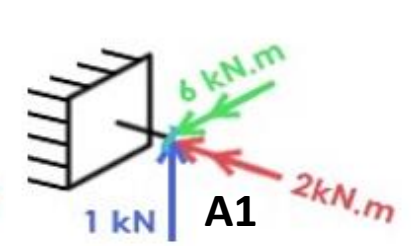


C2



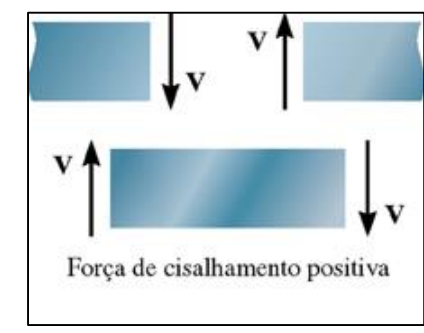
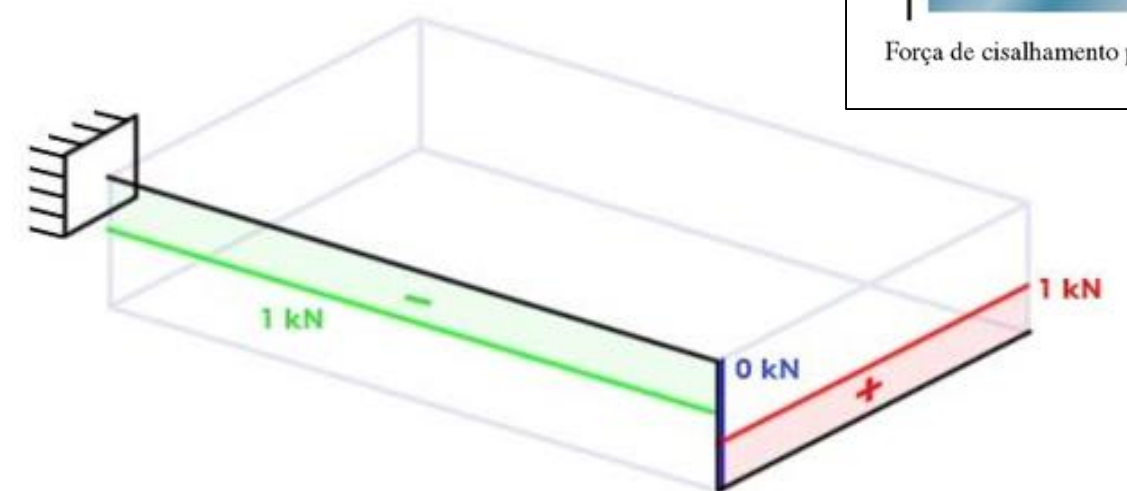
B1

B2

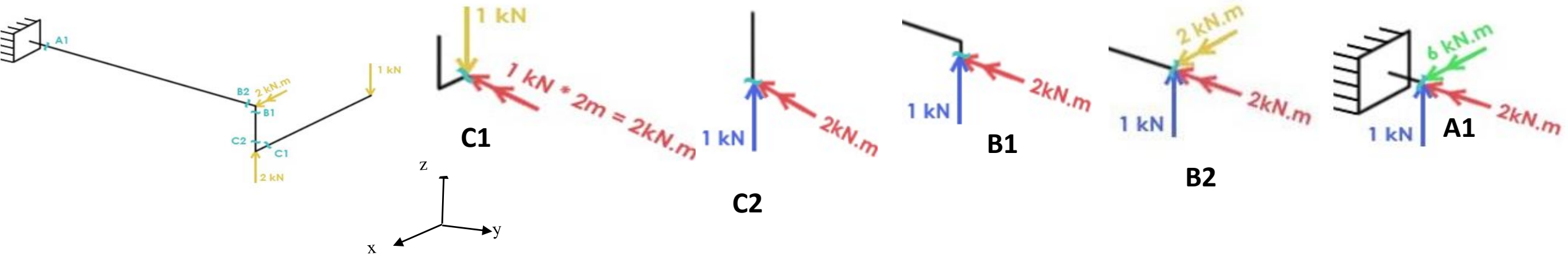


A1

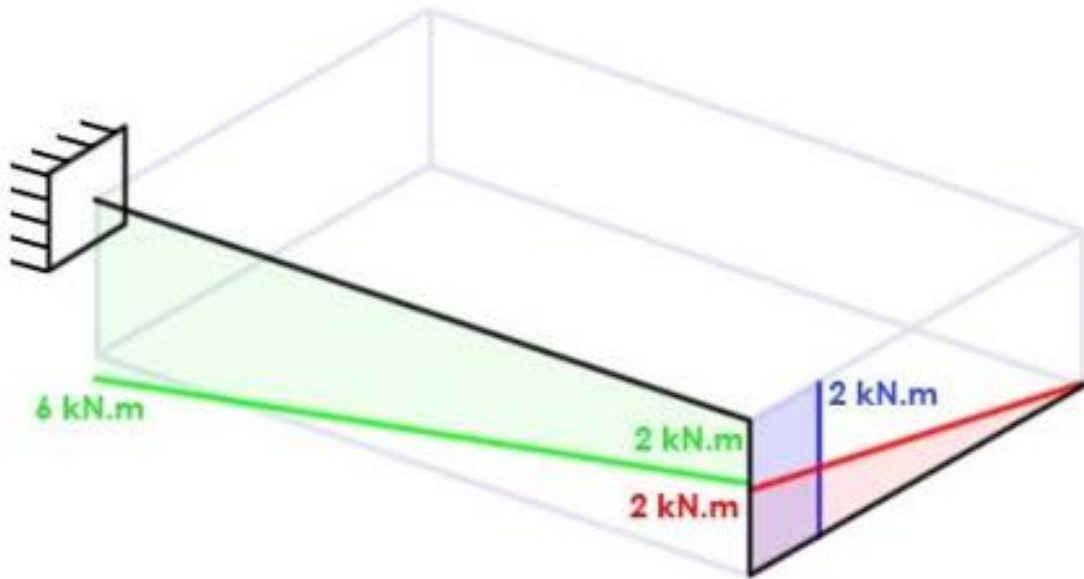
FORÇA CORTANTE



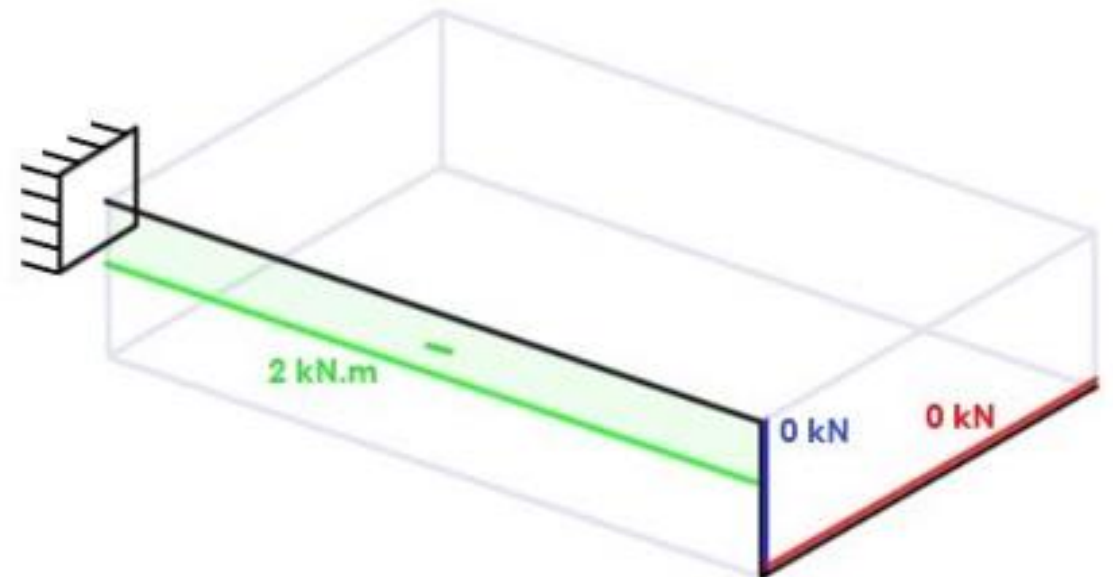
DIAGRAMAS DOS ESFORÇOS SOLICITANTES: MOMENTO FLETOR E MOMENTO DE TORÇÃO



MOMENTO FLETOR

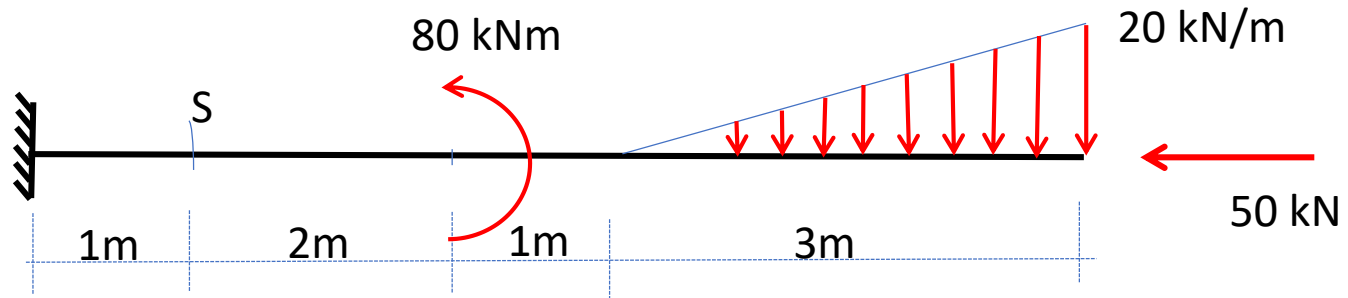


MOMENTO DE TORÇÃO



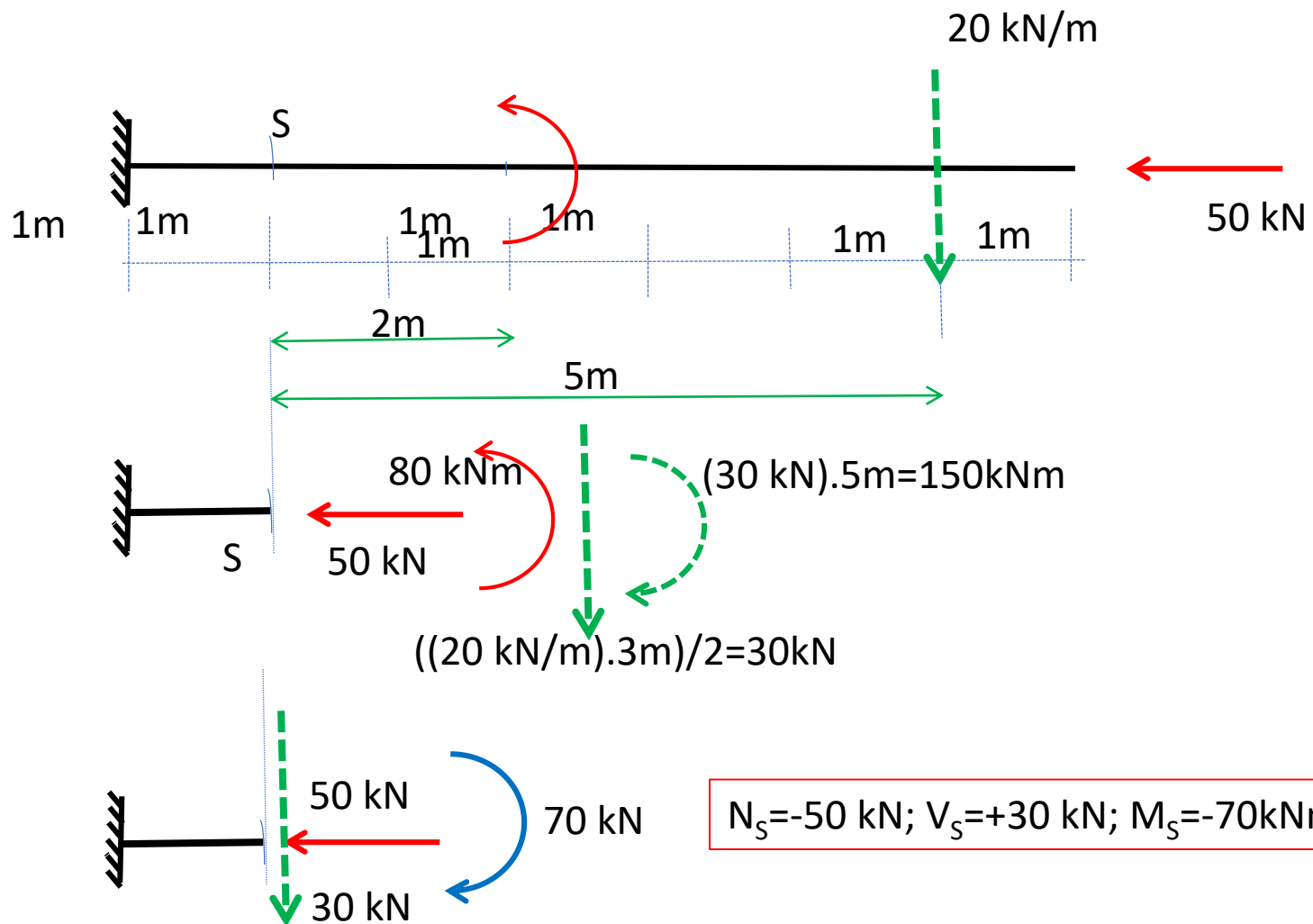
EXTRA

Determinar os valores dos esforços solicitantes na seção S da viga em balanço da figura

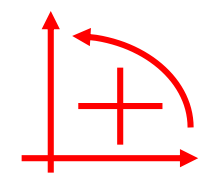


EXTRA

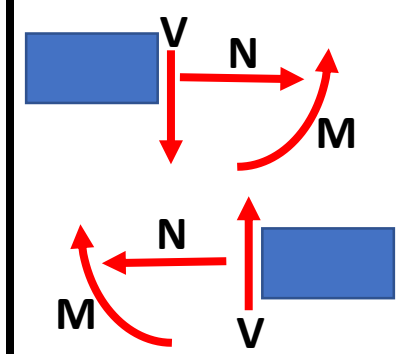
Determinar os valores dos esforços solicitantes na seção S da viga em balanço da figura



Convenção para o equilíbrio: GRINTER



Convenção para esforços solicitantes: +



$N_S = -50 \text{ kN}; V_S = +30 \text{ kN}; M_S = -70 \text{ kNm}$