HOJA
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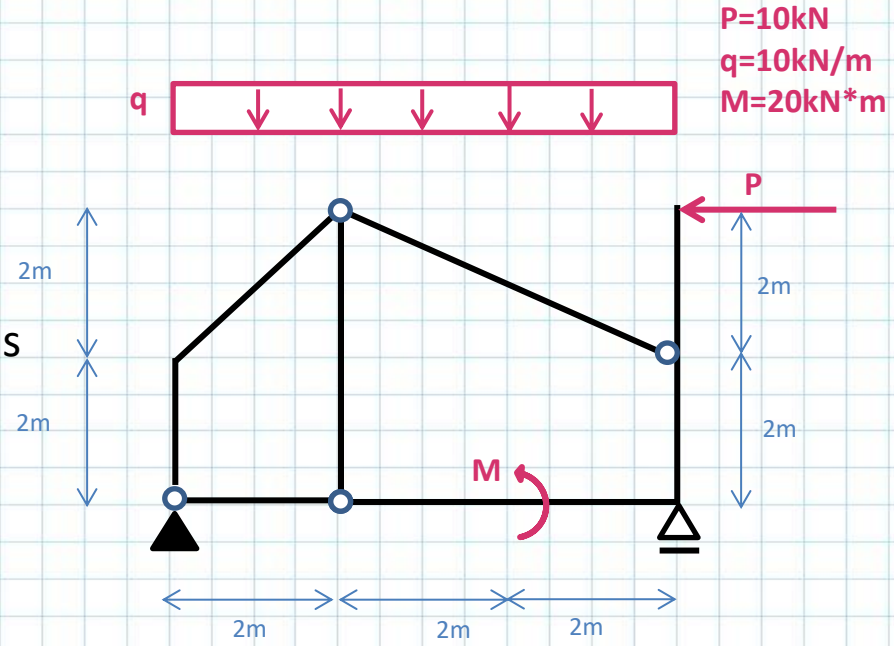
TEMA
DIAGRAMAS 2D

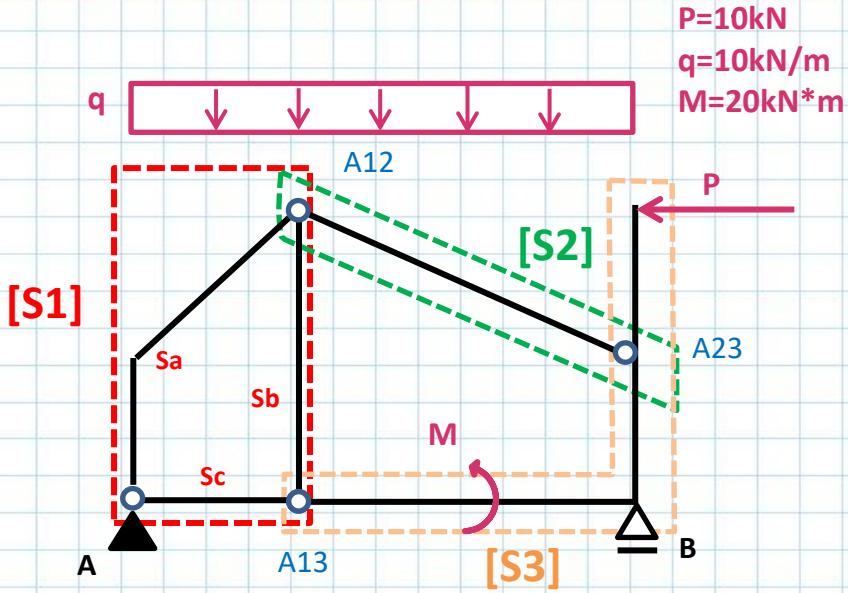
EJERCICIO

1. Análisis cinemático
2. Cálculo de RVE
3. Despiece
4. Diagramas de características



Ejemplo

1. Análisis cinemático



- Sa, Sb, Sc forman una cadena cerrada de 3 chapas con art no alineadas: se comporta como un cuerpo rígido.

- S1, S2, S3 forman una cadena cerrada de 3 chapas con art no alineadas: se comporta como un cuerpo rígido.

- GL = CV, La estructura es isostática

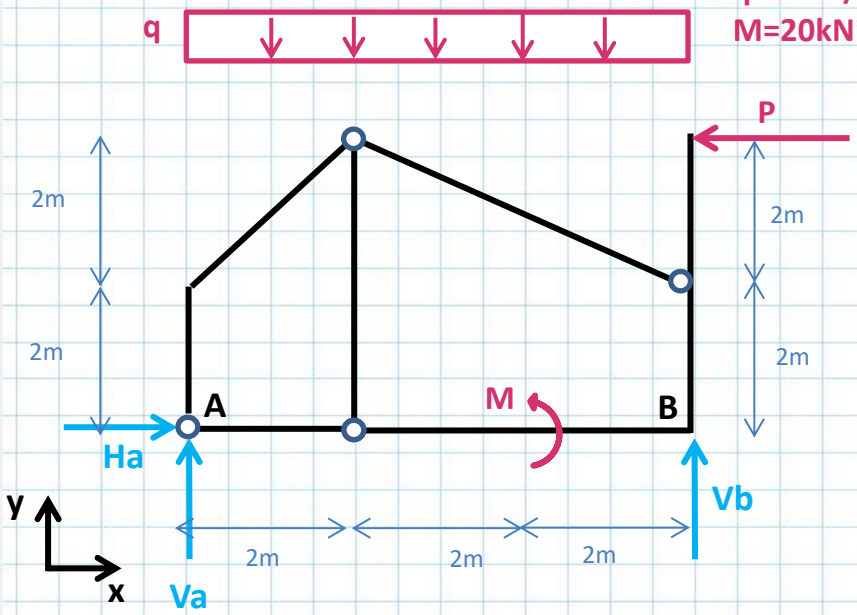
- La estructura se comporta como una única chapa. Tiene un apoyo fijo en A y un apoyo móvil en B cuya normal no pasa por el punto fijo: no existe vinculación aparente

- La estructura es cinemáticamente estable.

EJERCICIO

2. Reacciones de vínculo externo

P=10kN
q=10kN/m
M=20kN*m



Ecuaciones de equilibrio absoluto

$$\Sigma F_x := 0 \qquad \Sigma F_y := 0 \qquad \Sigma M_A := 0$$

$$\Sigma F_x = H_A - P$$
$$\Sigma F_y = V_A + V_B - q \cdot 6\ m$$
$$\Sigma M_A = M + V_B \cdot 6\ m + P \cdot 4\ m - q \cdot 6\ m \cdot 3\ m$$

Resuelvo:

$$\begin{bmatrix} V_A \\ H_A \\ V_B \end{bmatrix} := \text{find}\left(V_A, H_A, V_B\right) = \begin{bmatrix} 40 \\ 10 \\ 20 \end{bmatrix} \ kN$$

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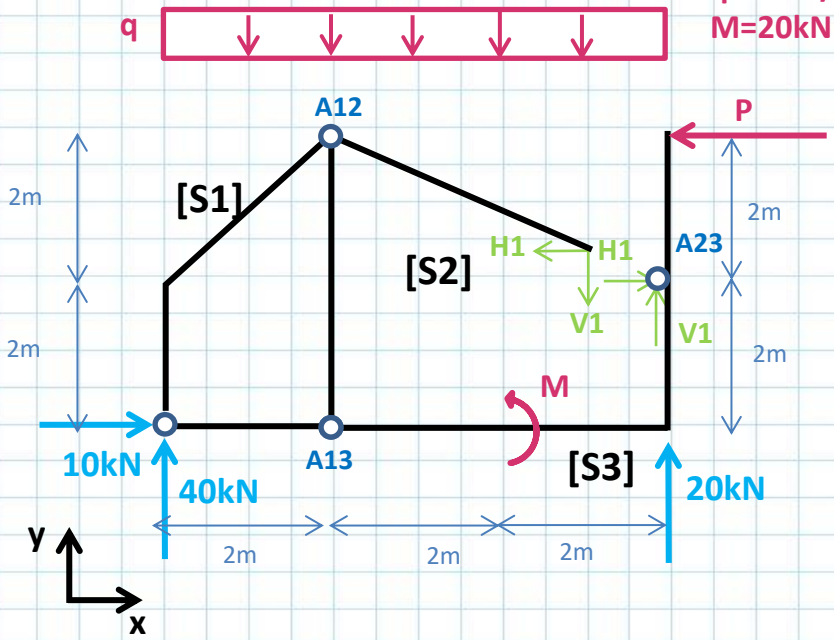
TEMA
DIAGRAMAS 2D

EJERCICIO

3. Despiece

P=10kN
q=10kN/m
M=20kN*m

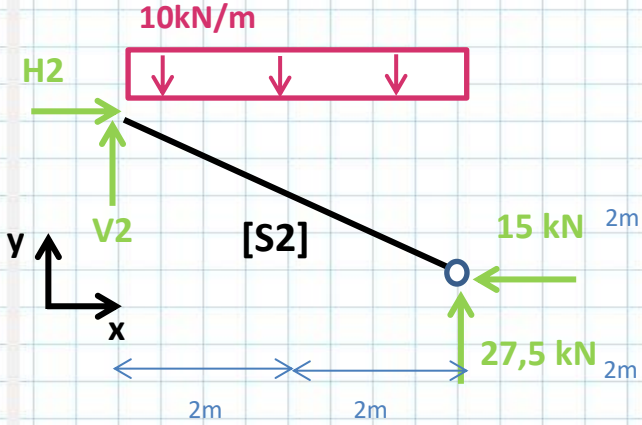


$$\Sigma M_{A12.S2} = -q \cdot 4\ m \cdot 2\ m - V_1 \cdot 4\ m - H_1 \cdot 2\ m$$
$$\Sigma M_{A13.S3} = M + 20\ kN \cdot 4\ m + V_1 \cdot 4\ m - H_1 \cdot 2\ m + P \cdot 4\ m$$

$$\begin{bmatrix} H_1 \\ V_1 \end{bmatrix} := \text{find}(H_1, V_1) = \begin{bmatrix} 15 \\ -27.5 \end{bmatrix} kN$$

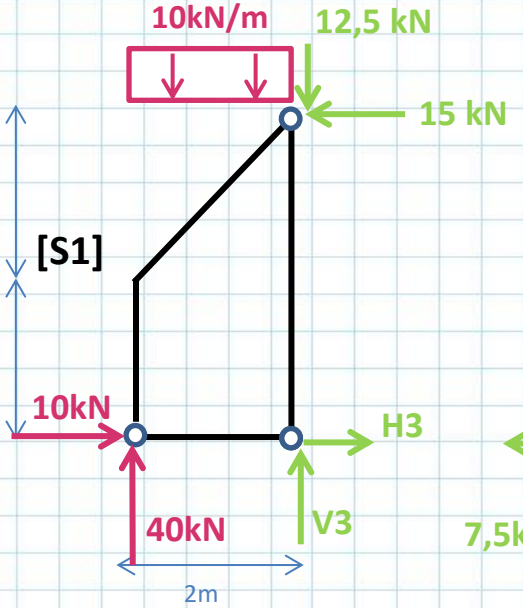
EJERCICIO

3. Despiece



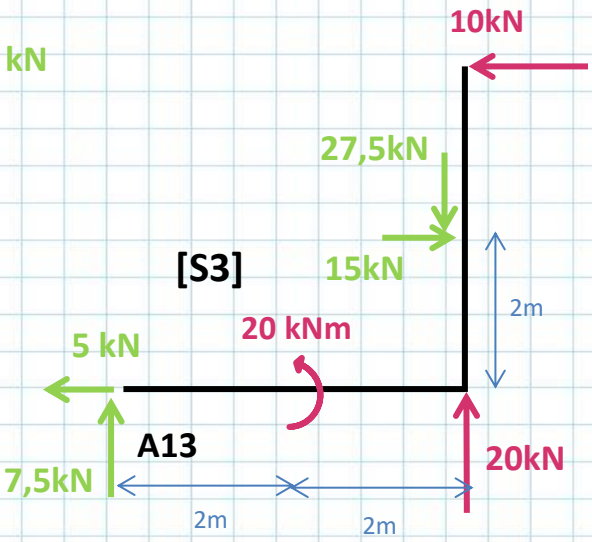
$$\Sigma F_{xS2} \quad H_2 - 15\ kN = 0 \xrightarrow{solve,H_2} 15 \cdot kN$$

$$\Sigma F_{yS2} \quad V_2 - q \cdot 4\ m + 27.5\ kN = 0 \xrightarrow{solve,V_2} 12.5 \cdot kN$$



$$\Sigma F_{xS1} \quad H_3 + 10\ kN - 15\ kN = 0 \xrightarrow{solve,H_3} 5 \cdot kN$$

$$\Sigma F_{yS1} \quad V_3 - 20\ kN - 12.5\ kN + 40\ kN = 0 \xrightarrow{solve,V_3} -7.5 \cdot kN$$



$$\Sigma F_{xS3} := 15\ kN - 10\ kN - 5\ kN = 0\ kN$$

$$\Sigma F_{yS3} := 7.5\ kN + 20\ kN - 27.5\ kN = 0\ kN$$

$$\Sigma M_{S3} := -15\ kN \cdot 2\ m + 10\ kN \cdot 4\ m + 20\ kN \cdot m - 7.5\ kN \cdot 4\ m = 0\ kN \cdot m$$

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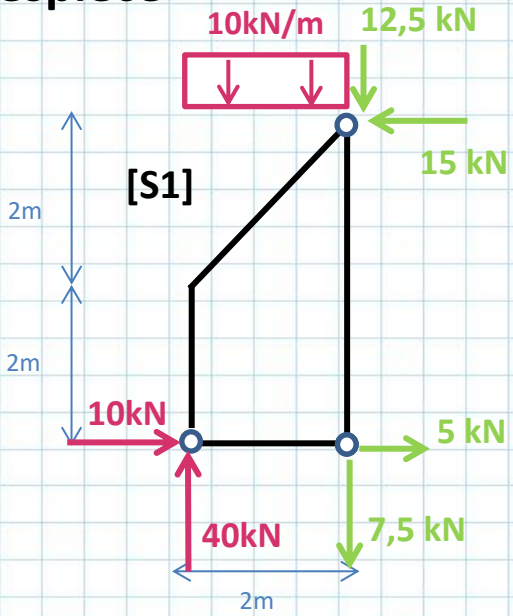
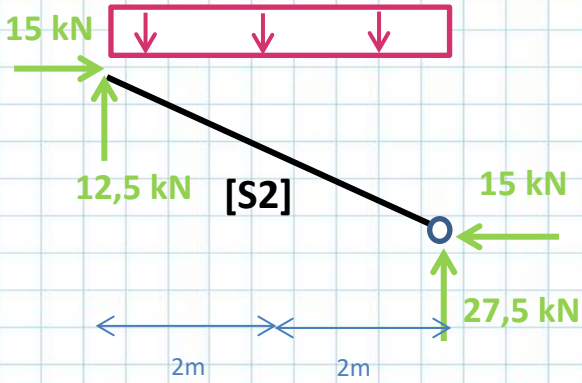
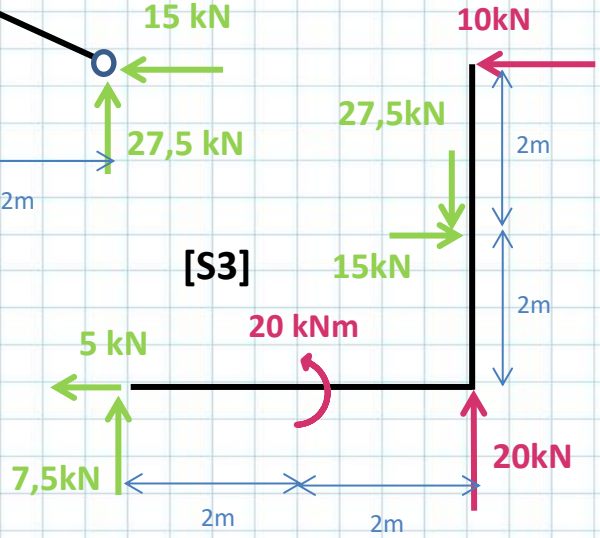
TEMA
DIAGRAMAS 2D

EJERCICIO

3. Despiece

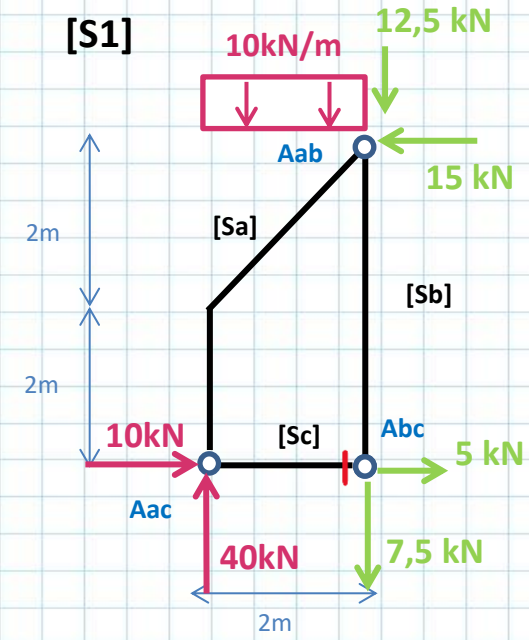


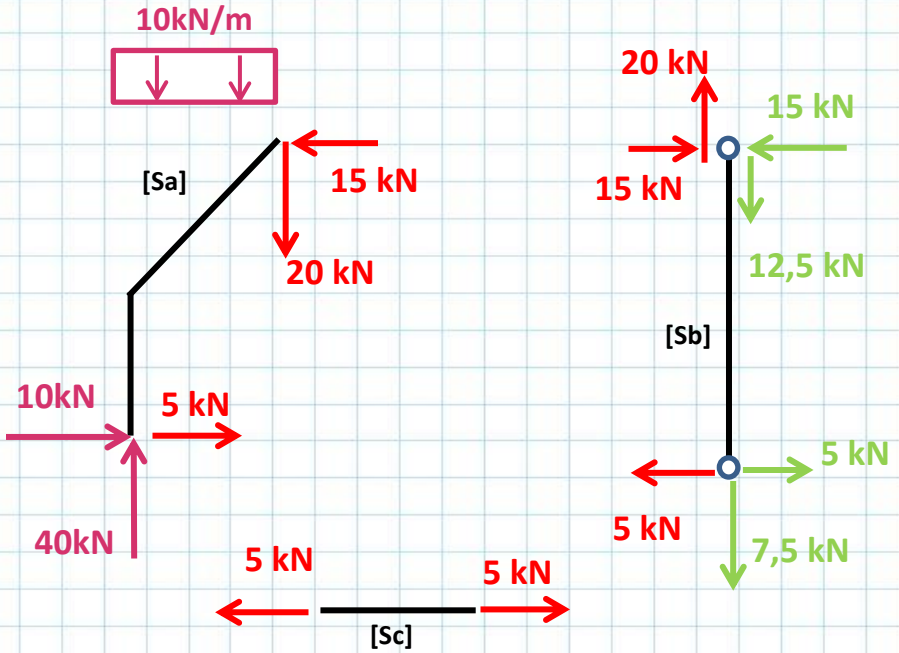




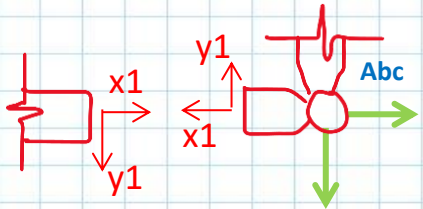
EJERCICIO

3. Despiece





Abro en Abc

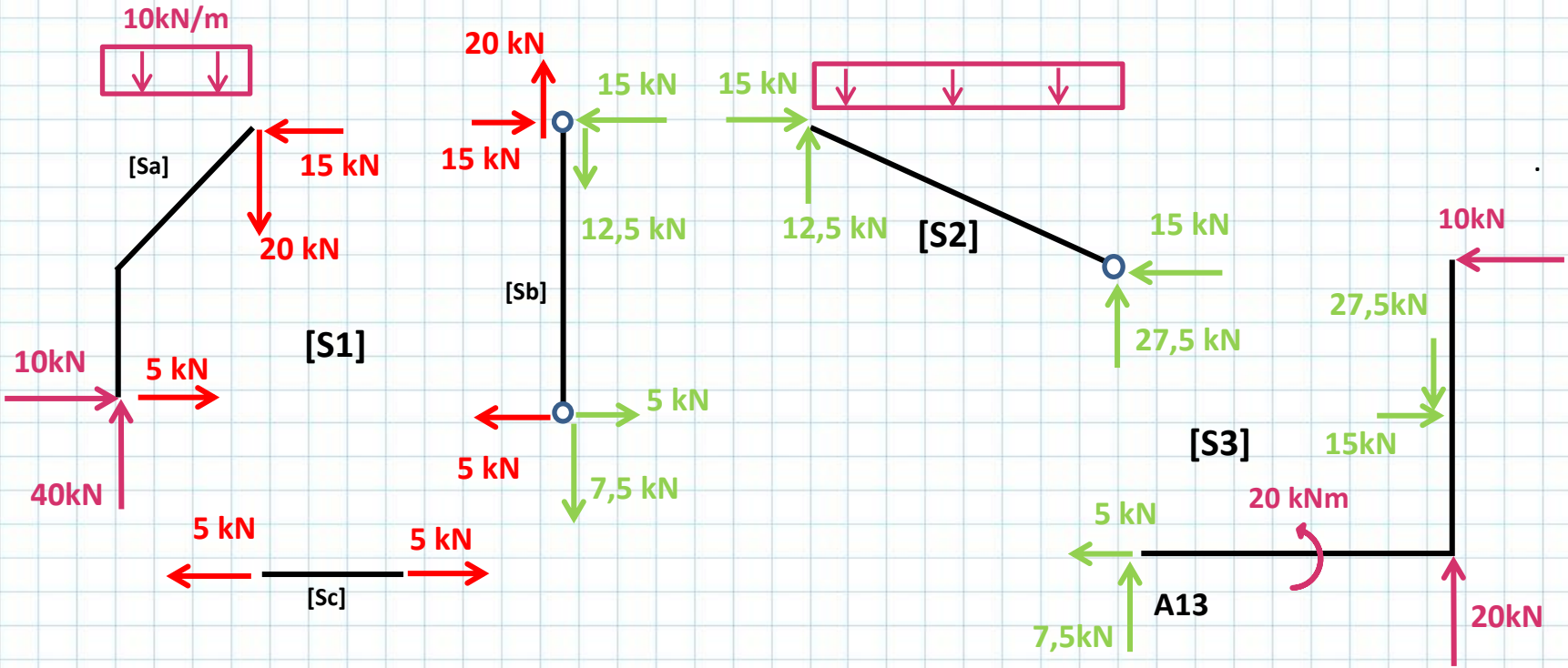


ΣM_Aac [Sc] = 0 despejo y1 = 0 kN
ΣM_Aab [Sb] = 0 despejo x1 =5kN

CHEQUEAR QUE TODO ESTE EN EQUILIBRIO

EJERCICIO

3. DCL de cada chapa



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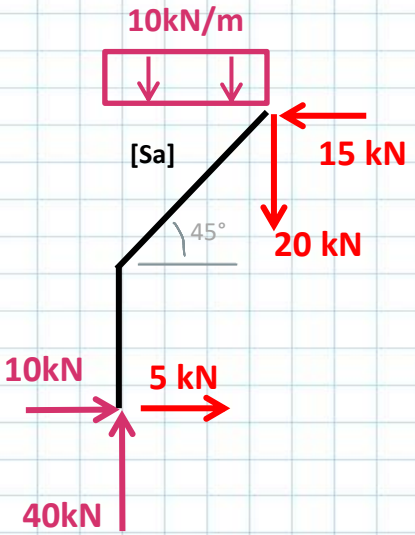
TEMA
DIAGRAMAS 2D

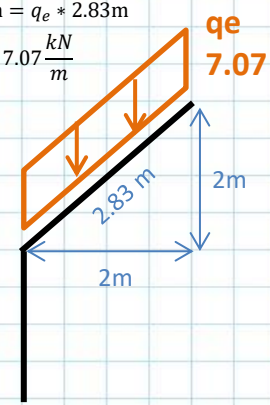
EJERCICIO

4. Análisis de chapa inclinada



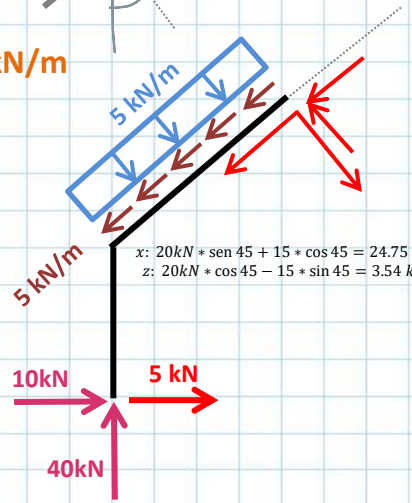
$$10\frac{kN}{m} * 2\text{m} = q_e * 2.83\text{m}$$

$$q_e = 7.07\frac{kN}{m}$$

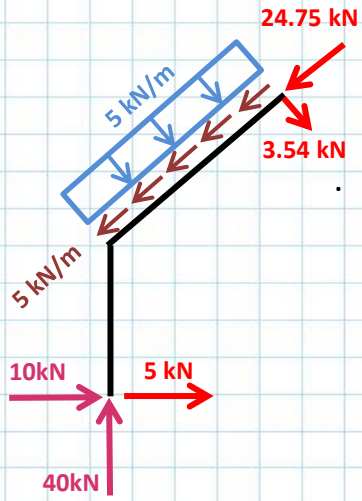


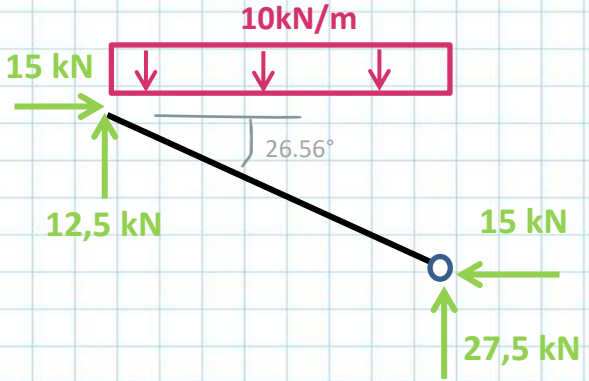
$$q_x = 7.07\frac{kN}{m} * \sin 45 = 5\frac{kN}{m}$$

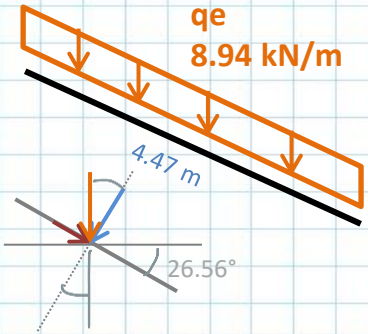
$$q_z = 7.07\frac{kN}{m} * \cos 45 = 5\frac{kN}{m}$$

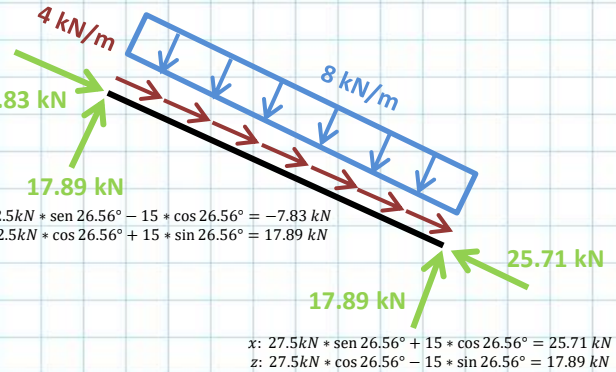


x: $20kN * \text{sen } 45 + 15 * \cos 45 = 24.75\ kN$
z: $20kN * \cos 45 - 15 * \sin 45 = 3.54\ kN$







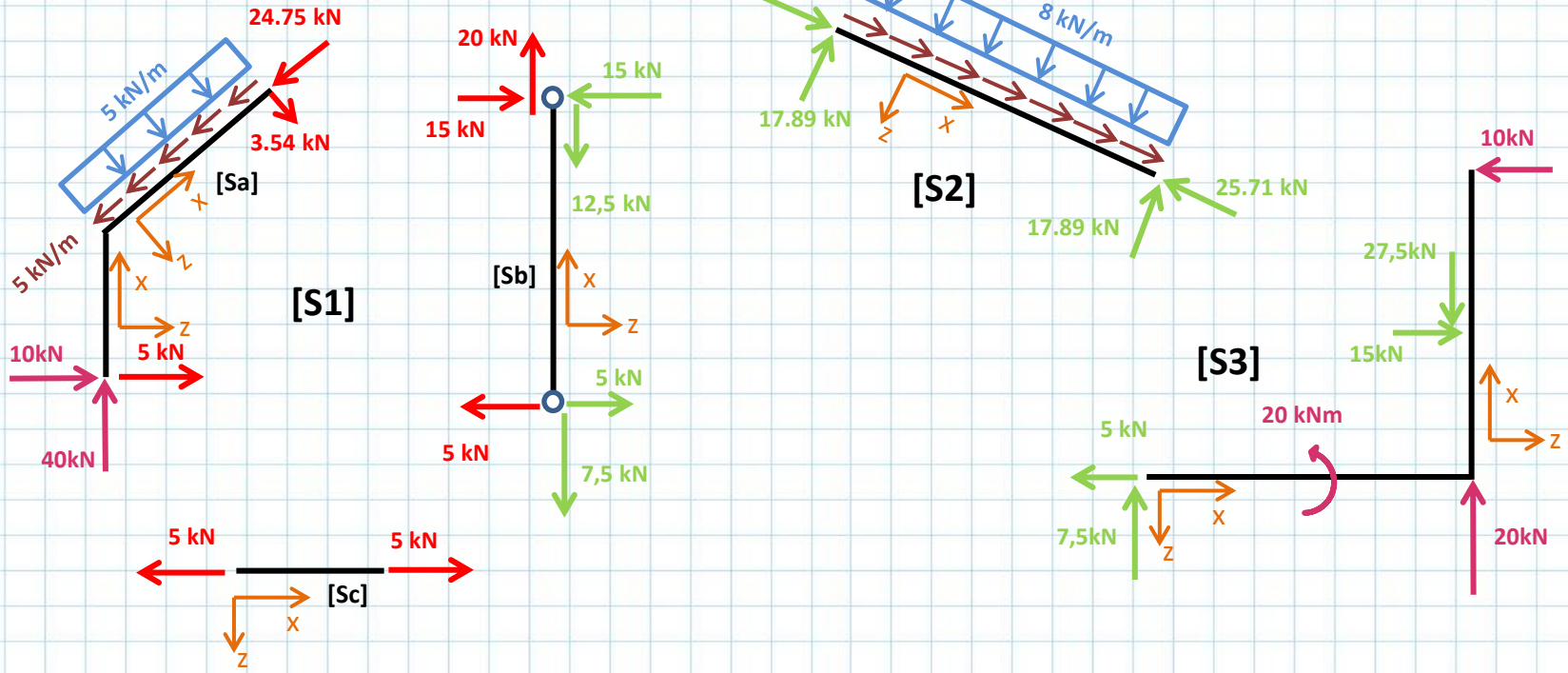


x: $12.5kN * \text{sen } 26.56° - 15 * \cos 26.56° = -7.83\ kN$
z: $12.5kN * \cos 26.56° + 15 * \text{sin } 26.56° = 17.89\ kN$

x: $27.5kN * \text{sen } 26.56° + 15 * \cos 26.56° = 25.71\ kN$
z: $27.5kN * \cos 26.56° - 15 * \text{sin } 26.56° = 17.89\ kN$

EJERCICIO

4. Diagramas de características



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TEMA
DIAGRAMAS 2D

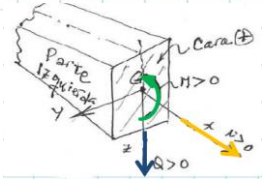
EJERCICIO

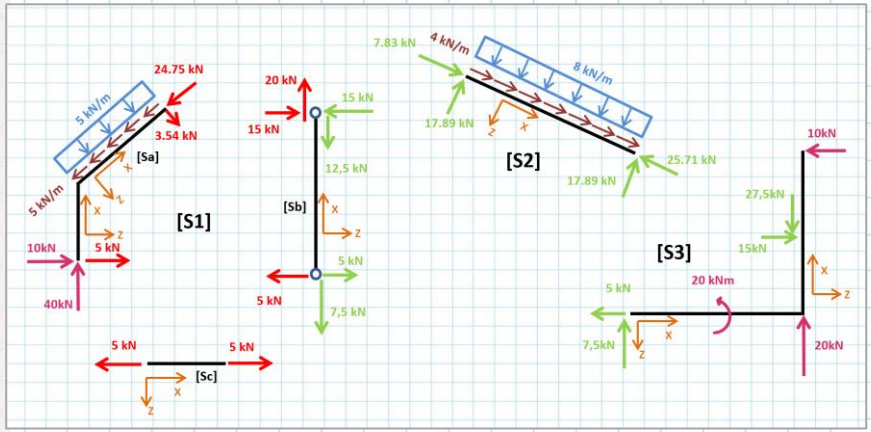
5. Diagramas de características

$$\frac{\partial N_x(x)}{\partial x} = -q_x(x)$$

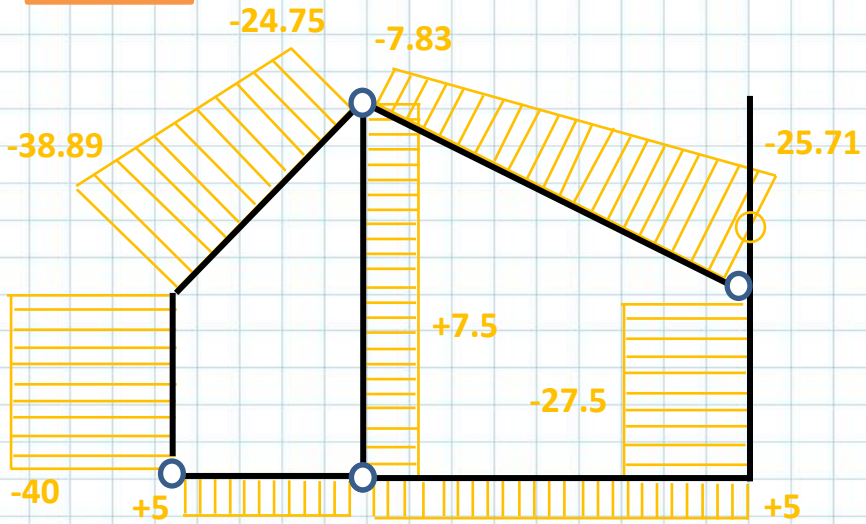
$$\frac{\partial Q_z(x)}{\partial x} = -q_z(x)$$

$$\frac{\partial M_y(x)}{\partial x} = Q_z(x)$$





N [kN]



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TEMA
DIAGRAMAS 2D

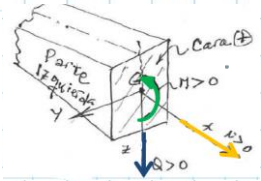
EJERCICIO

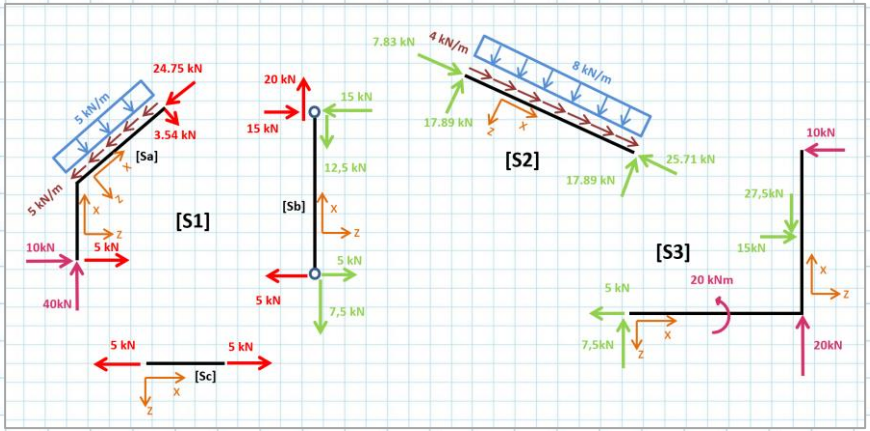
5. Diagramas de características

$$\frac{\partial N_x(x)}{\partial x} = -q_x(x)$$

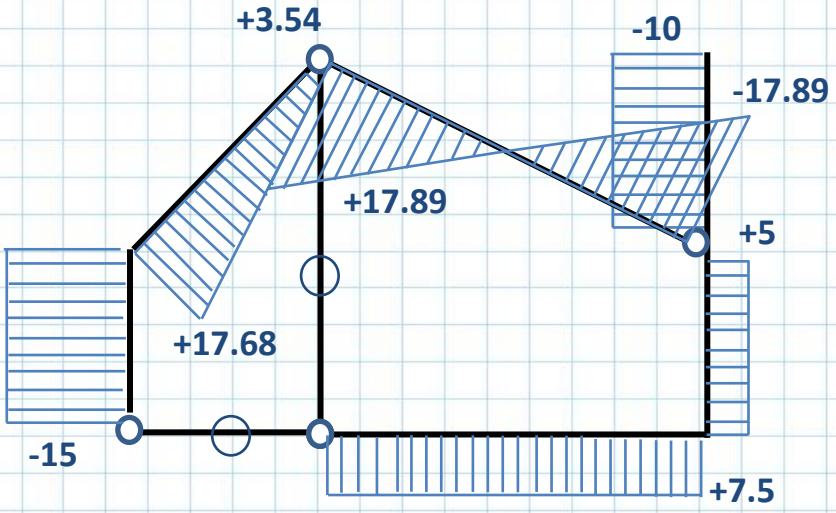
$$\frac{\partial Q_z(x)}{\partial x} = -q_z(x)$$

$$\frac{\partial M_y(x)}{\partial x} = Q_z(x)$$





Q[kN]



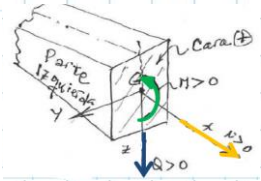
EJERCICIO

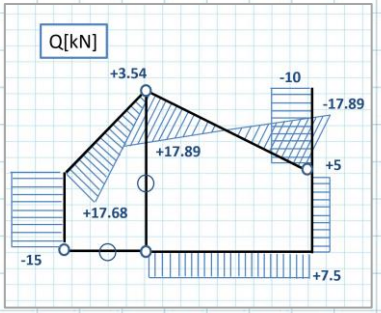
5. Diagramas de características

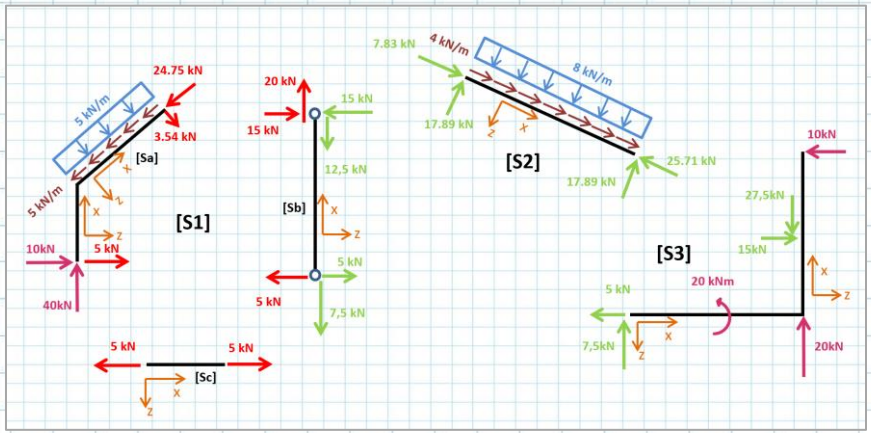
$$\frac{\partial N_x(x)}{\partial x} = -q_x(x)$$

$$\frac{\partial Q_z(x)}{\partial x} = -q_z(x)$$

$$\frac{\partial M_y(x)}{\partial x} = Q_z(x)$$







M[kNm]