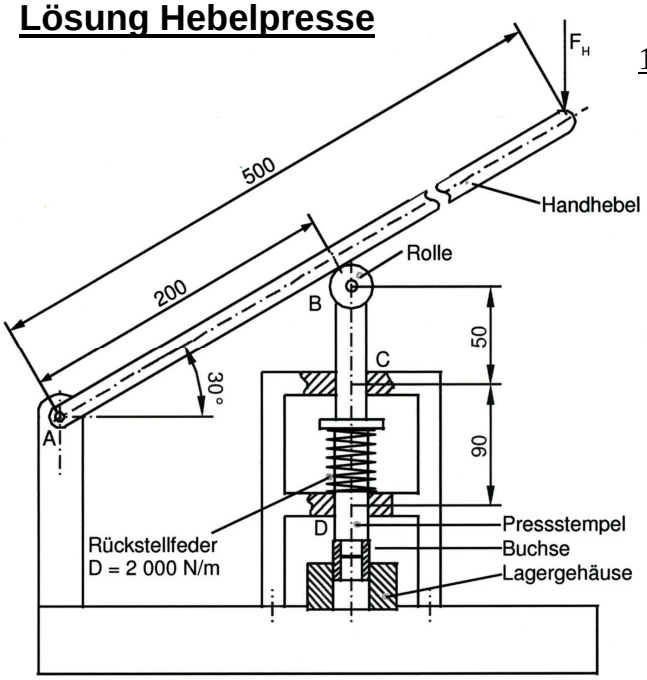
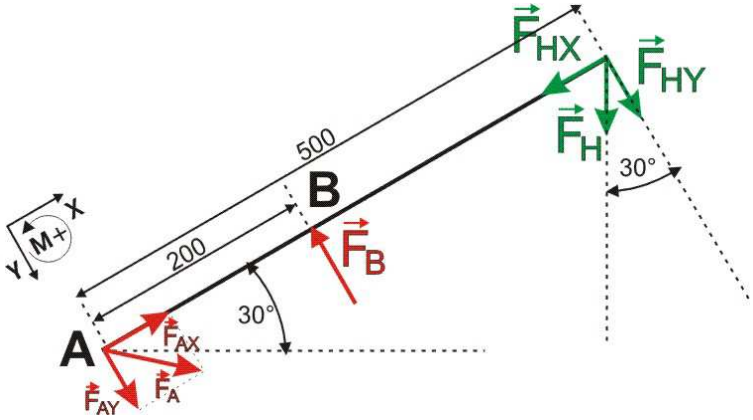
Technisches Gymnasium Bad Mergentheim	Name	Klasse	Datum	Fach	Blatt
		TG 12		T-M	1

Lösung Hebelpresse

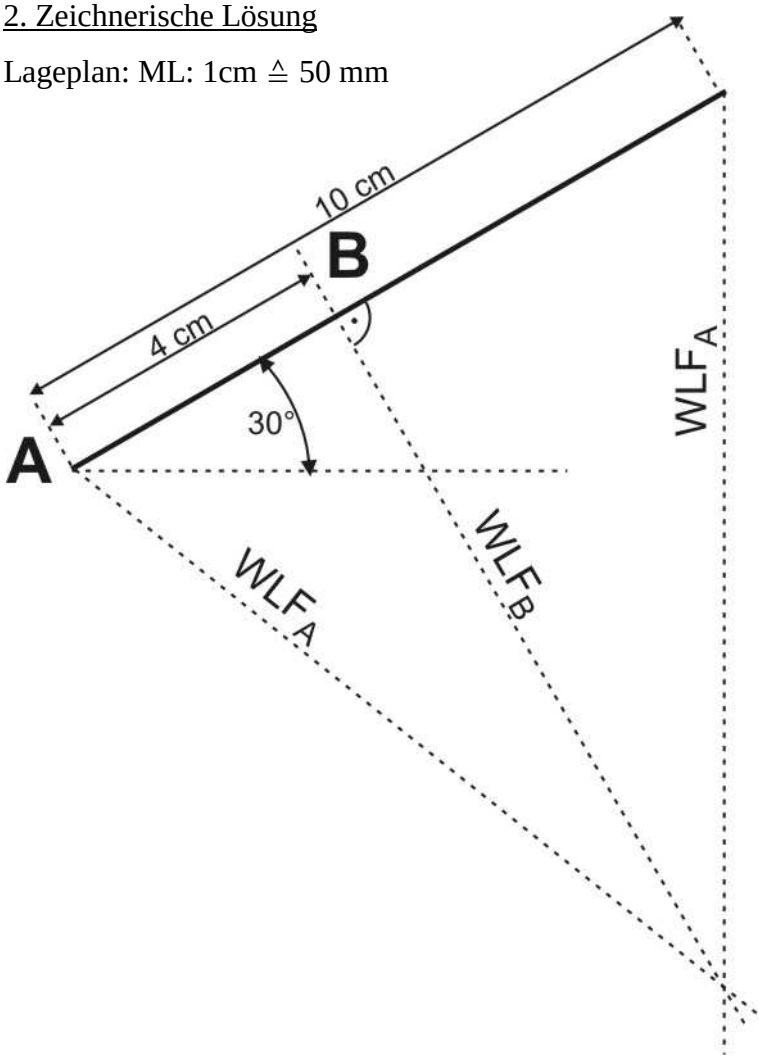


1. Freimachskizze

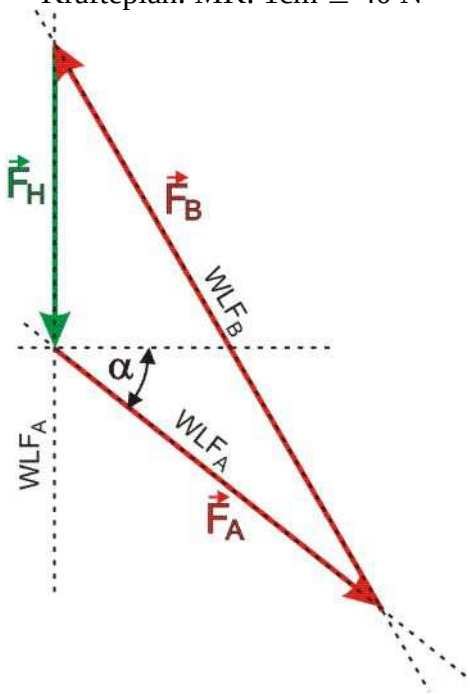


2. Zeichnerische Lösung

Lageplan: ML: 1cm ≙ 50 mm



Kräfteplan: MK: 1cm ≙ 40 N

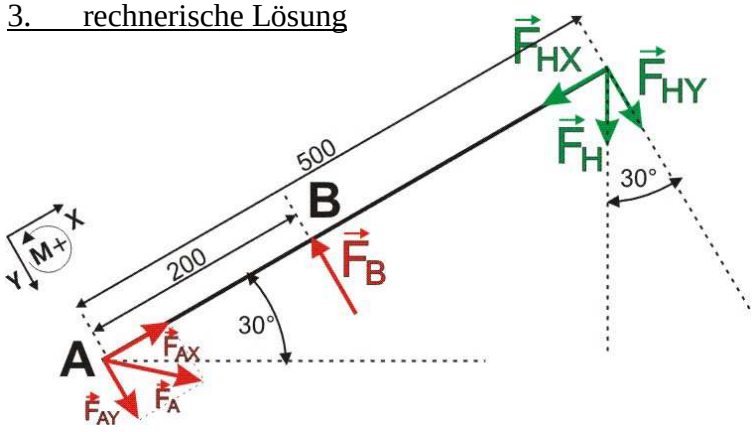


F_B = 8,6 cm · 40 N/cm = <u>344 N</u>

F_A = 5,5 cm · 40 N/cm = <u>220 N</u>

α = 39° (gemessen)

3. rechnerische Lösung



$F_{HY} = F_H \cdot \cos 30° = 160\ N \cdot \cos 30° = 138{,}6\ N$

$F_{HX} = F_H \cdot \sin 30° = 160\ N \cdot \sin 30° = 80\ N$

$\Sigma F_{Xi} = 0$: $F_{AX} - F_{HX} = 0$ (1)

$\Sigma F_{Yi} = 0$: $F_{Ay} - F_B + F_{HY} = 0$ (2)

$\Sigma M_A = 0$: $F_B \cdot 200\ mm - F_{HY} \cdot 500\ mm = 0$ (3)

(3) → $F_B = \frac{F_{HY} \cdot 500mm}{200mm} = \frac{138{,}6N \cdot 500mm}{200mm}$

$F_B = 346{,}5\ N$

(2) → $F_{AY} = F_B - F_{HY} = 346{,}5\ N - 138{,}6\ N = 207{,}9\ N$

(3) → $F_{AX} = F_{HX} = 80\ N$

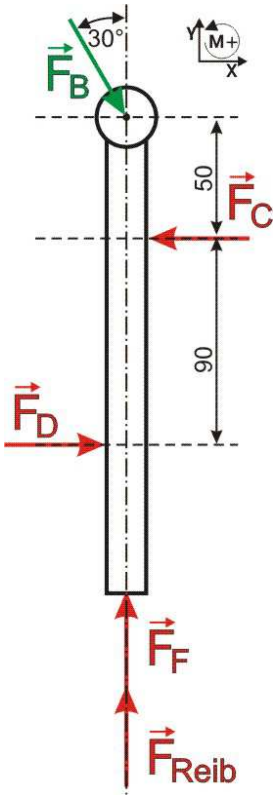
Pythagoras: $F_A = \sqrt{F_{AX}^2 + F_{AY}^2} = \sqrt{80^2 + 209{,}7^2}\ N = 224{,}4\ N$

Winkel α zwischen F_A und der X-Achse: $\tan\alpha = \frac{F_{AY}}{F_{AX}} = \frac{207{,}9N}{80N}$ → 69°

da das Koordinatensystem um 30° gedreht ist, ergibt sich zur Waagrechten ein Winkel von

α' = α - 30° = 69° - 30° = 39°

4. Freimachskizze



5. Berechnung der Kräfte F_C, F_D und F_{Reib}

$F_{BX} = F_B \cdot \sin 30° = 350\ N \cdot \sin 30° = 175\ N$

$F_{BY} = F_B \cdot \cos 30° = 350\ N \cdot \cos 30° = 303{,}1\ N$

$\Sigma F_{Xi} = 0$: $F_{BX} - F_C + F_D = 0$ (1)

$\Sigma F_{Yi} = 0$: $F_F + F_{Reib} - F_{BY} = 0$ (2)

$\Sigma M_D = 0$: $F_C \cdot 90\ mm - F_{BX} \cdot 140\ mm = 0$ (3)

(3) → $F_C = \frac{F_{BX} \cdot 140mm}{90mm} = \frac{175N \cdot 140mm}{90mm} = 272{,}2\ N$

(1) → $F_D = F_C - F_{BX} = 272{,}2\ N - 175\ N = 97{,}2\ N$

(2) → $F_F + F_{Reib} = F_{BY} = 303{,}1\ N$

$F_F = D \cdot \Delta s = 2000\ N/m \cdot 0{,}05\ m = 100\ N$

→ $F_{Reib} = 303{,}1\ N - 100\ N = 203{,}1\ N$