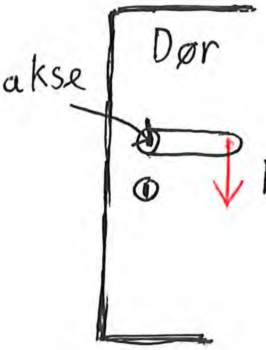
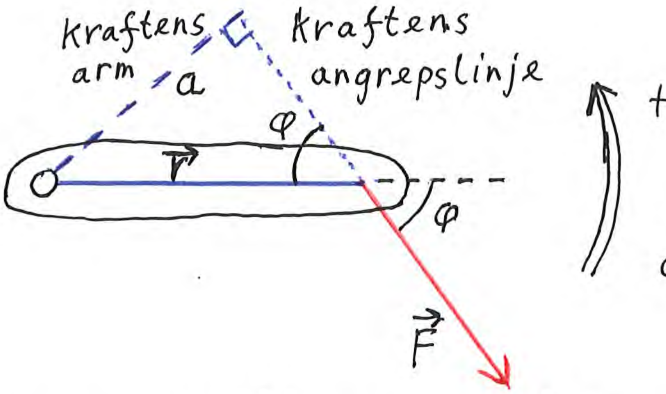
14. Statikk

Likevekt ved rotasjon om en akse





$\sin\varphi = \frac{a}{r}$

$a = r \cdot \sin\varphi$

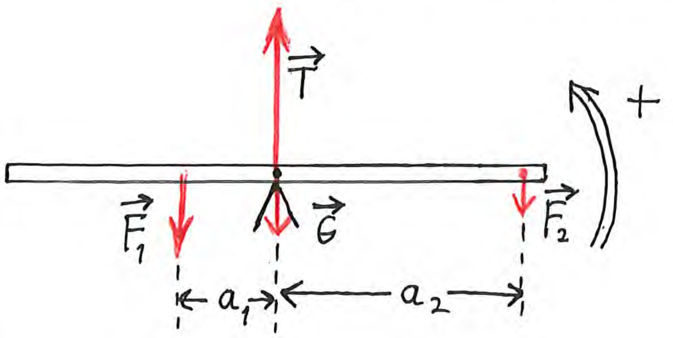
Kraftmoment M av en kraft om en akse er lik arm·kraft, der armen er avstanden a fra aksen til angrepslinja for kraften $\vec{F}$

$$M = aF \qquad (\vec{M} = \vec{r} \times \vec{F})$$

$$M = r \cdot F \cdot \sin\varphi \qquad [Nm]$$

14.02,03

Likevektsvilkår for stive legemer



$\sum \vec{F} = 0$ og $\sum M = 0$

Eks 14.3 ↗ $\quad m_1 = 80\,kg \quad m_2 = 30\,kg \quad a_2 = 1{,}20\,m \quad a_1 = ?$

$$\sum M = 0$$

$$M_1 - M_2 = 0$$

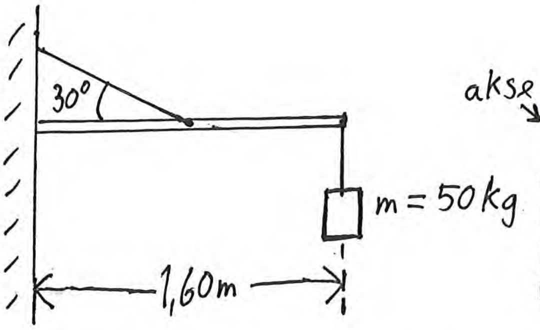
$$a_1 F_1 - a_2 F_2 = 0 \qquad \text{og } F = mg$$

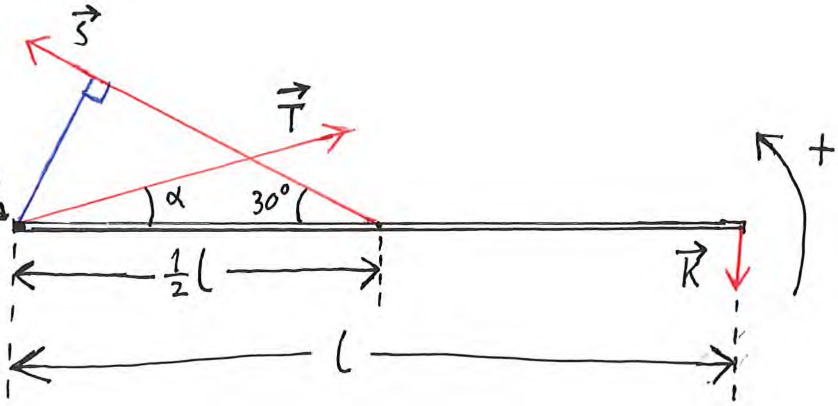
$$a_1 m_1 g = a_2 m_2 g$$

$$a_1 = a_2 \cdot \frac{m_2}{m_1} = 1{,}20\,m \cdot \frac{30\,kg}{80\,kg} = \underline{0{,}45\,m}$$

14,04

Eks. 14.4





a) $S = ?$

$$\sum M = 0$$

$$M_S - M_K + M_T = 0 \quad \text{og} \quad M_T = 0$$

$$a_s \cdot S - a_K \cdot K + 0 = 0$$

$$\tfrac{1}{2} l \cdot \sin 30° \cdot S = l m g$$

$$S = \frac{2mg}{\sin 30°} = \frac{2 \cdot 50\,\text{kg} \cdot 9{,}81\,\frac{\text{N}}{\text{kg}}}{\sin 30°} = 1962\,\text{N}$$

$$= \underline{2{,}0\,\text{kN}}$$

b) $\vec{T} = ?$

$$\sum \vec{F} = 0$$

$$\sum F_x = 0$$

$$T_x - S_x = 0$$

$$T_x = S \cdot \cos 30° = 1962\,\text{N} \cdot \cos 30° = 1699\,\text{N}$$

$$\sum F_y = 0$$

$$T_y + S_y - K = 0$$

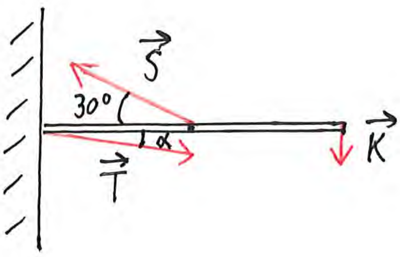
$$T_y + S \cdot \sin 30° - K = 0$$

$$T_y = mg - S \cdot \sin 30° = 50\,\text{kg} \cdot 9{,}81\,\frac{\text{N}}{\text{kg}} - 1962\,\text{N} \cdot \sin 30° = -490{,}5\,\text{N} \quad (\text{ned})$$

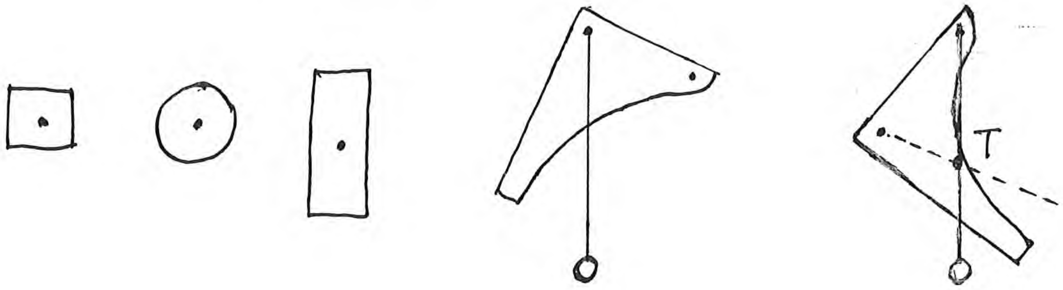
$$T = \sqrt{T_x^2 + T_y^2} = \sqrt{1699^2 + (-490{,}5)^2}\,\text{N} = \underline{1{,}8\,\text{kN}}$$

$$\tan \alpha = \frac{T_y}{T_x} = \frac{-490{,}5\,\text{N}}{1699\,\text{N}}$$

$$\underline{\alpha = -16°}$$

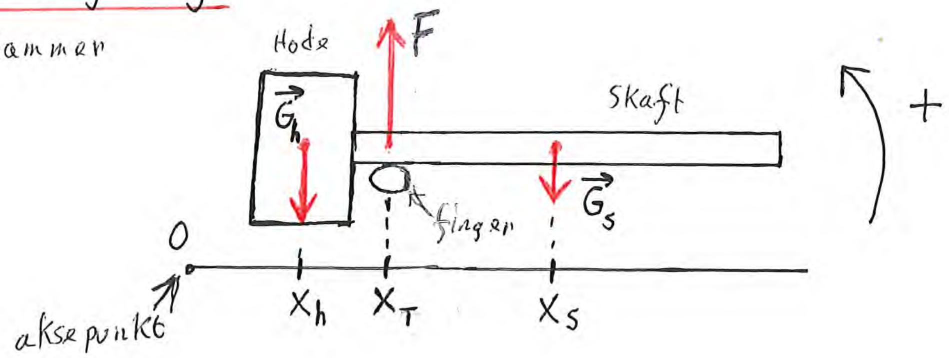


Tyngdepunkt (massemiddelpunkt)



Beregning

Hammer



$$\sum M = 0$$

$$M_f - M_h - M_s = 0$$

fra finger

$$x_T F - x_h G_h - x_s G_s = 0$$

$$x_T = \frac{x_h G_h + x_s G_s}{G_h + G_s} \quad \text{fordi } F = G_h + G_s$$

Generelt:

$$x_T = \frac{x_1 G_1 + x_2 G_2 + \cdots x_n G_n}{G_1 + G_2 + \cdots G_n} = \frac{\sum x_i G_i}{G}$$

og $y_T = \frac{\sum y_i G_i}{G}$

G_i = deltyngde

G = hel tyngde

$$x_T = \frac{\sum x_i m_i}{m} \quad \text{på jorda}$$

14.10.11