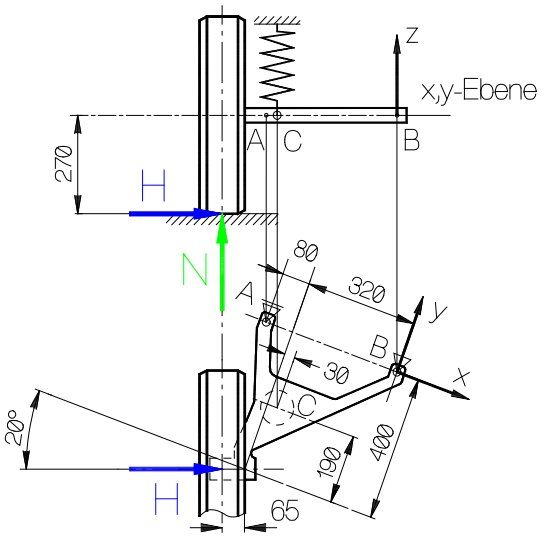

Kräfte: $\vec{H}=\begin{pmatrix} H\cos 20^\circ \\ H\sin 20^\circ \\ 0 \end{pmatrix};\vec{N}=\begin{pmatrix} 0 \\ 0 \\ N \end{pmatrix};$

$\vec{C}=\begin{pmatrix} 0 \\ 0 \\ C \end{pmatrix};\vec{B}=\begin{pmatrix} B_x \\ B_y \\ B_z \end{pmatrix};\vec{A}=\begin{pmatrix} 0 \\ A_y \\ A_z \end{pmatrix}$

Ortsvektoren:

$\vec{r}_H=\begin{pmatrix} -320 \\ -400 \\ -270 \end{pmatrix};\vec{r}_N=\begin{pmatrix} -320-65\cdot\cos 20^\circ \\ -400-65\cdot\sin 20^\circ \\ -270 \end{pmatrix};$

$\vec{r}_C=\begin{pmatrix} -290 \\ -210 \\ 0 \end{pmatrix};\vec{r}_B=\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix};\vec{r}_A=\begin{pmatrix} -400 \\ 0 \\ 0 \end{pmatrix}$

$\sum_i \vec{M}_i=\sum_i \vec{r}_i\times\vec{F}_i=0:$

$$\vec{r}_H\times\vec{H}=\begin{vmatrix} \vec{e}_x & \vec{e}_y & \vec{e}_z \\ -320 & -400 & -270 \\ H\cos 20^\circ & H\sin 20^\circ & 0 \end{vmatrix}=\begin{pmatrix} 270\cdot H\sin 20^\circ \\ -270\cdot H\cos 20^\circ \\ 400\cdot H\cos 20^\circ-320\cdot H\sin 20^\circ \end{pmatrix}$$

$$\vec{r}_N\times\vec{N}=\begin{vmatrix} \vec{e}_x & \vec{e}_y & \vec{e}_z \\ -(320+65\cdot\cos 20^\circ) & -(400+65\cdot\sin 20^\circ) & -270 \\ 0 & 0 & N \end{vmatrix}=\begin{pmatrix} -N(400+65\cdot\sin 20^\circ) \\ N(320+65\cdot\cos 20^\circ) \\ 0 \end{pmatrix}$$

$$\vec{r}_C\times\vec{C}=\begin{vmatrix} \vec{e}_x & \vec{e}_y & \vec{e}_z \\ -290 & -210 & 0 \\ 0 & 0 & C \end{vmatrix}=\begin{pmatrix} -210\cdot C \\ 290\cdot C \\ 0 \end{pmatrix};\qquad \vec{r}_B\times\vec{B}=\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix};$$

$$\vec{r}_A\times\vec{A}=\begin{vmatrix} \vec{e}_x & \vec{e}_y & \vec{e}_z \\ -400 & 0 & 0 \\ 0 & A_Y & A_Z \end{vmatrix}=\begin{pmatrix} 0 \\ 400\cdot A_Z \\ -400\cdot A_Y \end{pmatrix}$$

$$\sum_i M_{i,X}=0:270\cdot H\sin 20^\circ-N(400+65\cdot\sin 20^\circ)-210\cdot C=0\rightarrow C=-11{,}2kN$$

$$\sum_i M_{i,Y}=0:-270\cdot H\cos 20^\circ+N(320+65\cdot\cos 20^\circ)+290\cdot C+400\cdot A_Z=0\rightarrow A_Z=4{,}43kN$$

$$\sum_i M_{i,Z}=0:400\cdot H\cos 20^\circ-320\cdot H\cdot\sin 20^\circ-400\cdot A_Y=0\rightarrow A_Y=2{,}53kN$$

$\sum_i \vec{F}_i=0:$

$\sum_i F_{i,X}=0:\quad B_X=-H\cdot\cos 20^\circ=-3{,}57\,\text{kN};\ \sum_i F_{i,Y}=0:\quad B_Y=-H\cdot\sin 20^\circ-A_Y=-3{,}83\,\text{kN}$

$\sum_i F_{i,Z}=0:\quad B_Z=-N-C-A_Z=0{,}37\,\text{kN}$

$$\vec{A}=\begin{pmatrix} 0 \\ 2{,}53 \\ 4{,}43 \end{pmatrix}kN\rightarrow A=5{,}1kN;\qquad \vec{B}=\begin{pmatrix} -3{,}57 \\ -3{,}83 \\ 0{,}37 \end{pmatrix}kN\rightarrow B=5{,}25kN;\qquad \vec{C}=\begin{pmatrix} 0 \\ 0 \\ -11{,}2 \end{pmatrix}kN$$