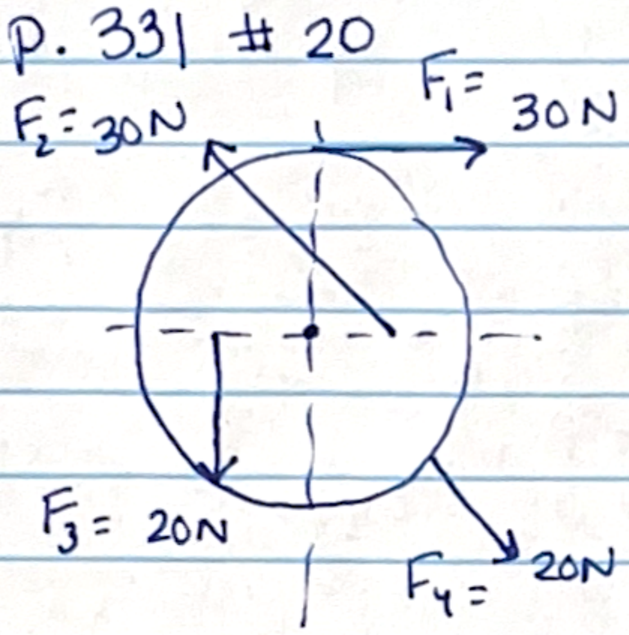
P. 331 # 20

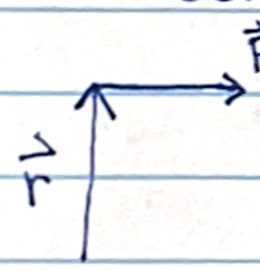


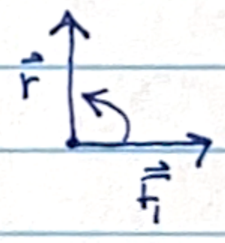
I have labeled each force. Now I will find the r, F, and ϕ for each one and then calculate the torque for each using $\tau = rF\sin\phi$

For F_1

$r = 10\,cm = 0.10\,m$

$F = 30N$



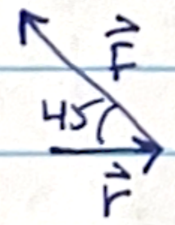
putting tails together to find ϕ:  , so $\phi = 90°$

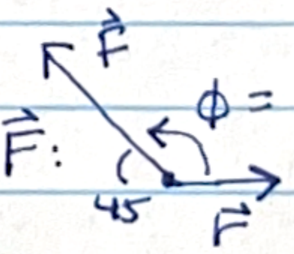
$\tau_1 = r_1 F_1 \sin\phi_1 = (0.10\,m)(30N)\sin 90° =$ **3 Nm CW**

For F_2

$r = 5.0\,cm$

$F = 30N$



I need the angle between $\vec{r}$ and $\vec{F}$: 

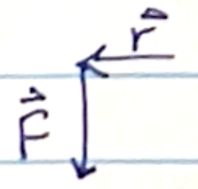
$\phi = 180 - 45° = 135°$

$\tau_2 = r_2 F_2 \sin\phi_2 = (0.05\,m)(30N)\sin 135° =$ **1.1 Nm CW**

For F_3

$r = 5.0\,cm$

$F = 20N$



$\phi = 90°$ because 

$\tau_3 = r_3 F_3 \sin\phi_3$
$= (.05m)(20N)\sin 90°$
$=$ **1 Nm CW**

For F_4,  $\phi = 0$, so $\tau = 0$.

Net torque?

There is a total of 2.1 Nm torque CCW and 3 Nm torque CW, so the net torque is → **0.9 Nm CW**