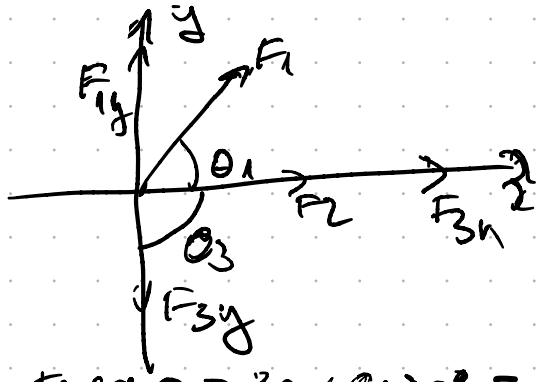
5)



$F_{1x} = F_1 \cos\theta = 32 \times \cos 30° = 27,7\ N$

$F_{1y} = F_1 \sin\theta_1 = 32 \times \sin 30° = 16\ N$

$F_{3x} = F_3 \cos\theta_3 = 41 \times \cos 60° = 20,5\ N$

$F_{3y} = F_3 \sin\theta_3 = 41 \times \sin 60° = 35,5\ N$

$F_x = F_{1x} + F_{2x} + F_{3x}$

$= 27,7 + 55 + 20,5 = 103,2\ N$

$F_y = F_{1y} + F_{2y} + F_{3y}$

$= 16 + 0 + 35,5 = 51,5\ N$

a) $\hat{a} = \frac{1}{120}\left[\frac{103,2\hat{i} + 51,5\hat{j}}{\sqrt{(103,2)^2 + (51,5)^2}}\right] = \frac{103,2\hat{i} + 51,5\hat{j}}{138,40}$

b) magnitude $= \frac{\sqrt{103,2^2 + 51,6^2}}{120} = 1,15\ m/s^2$

7) a) $= 12\ m/s^2$

$m = 2\ kg$

$F = 24\ N$

$F_x = F \sin 30° = 12\ N$

$F_y = 12\sqrt{3}\ N$

$\vec{F} = -12\hat{i} - 12\sqrt{3}\hat{j}$

$\Rightarrow \vec{F} = 20\hat{i}$; $\vec{F_2} = \vec{F} - \vec{F_1} = 32\hat{i} - 0\sqrt{3}\hat{i}$

$|\vec{F_2}| = \sqrt{(32)^2 + (0\sqrt{3})^2} = 38,16\ N$

a) unit vector $= \frac{\vec{F_2}}{|\vec{F_2}|} = \frac{32\hat{i} - 12\sqrt{3}\hat{j}}{38,16}$

b) magnitude $= 38,16\ N$

c) Angle $= \tan^{-1}\left(\frac{y}{x}\right) = \tan^{-1}\left(\frac{12\sqrt{3}}{32}\right) = 33°$

$\Rightarrow$ angle $= 180° - 33° = 147°$

13) $T_3 = 9{,}8\,N$ $T_2 = 4\,9\,N$
$D = 1\,kg$
$T_1 = 58{,}8\,N \Rightarrow m_B = 1\,kg$
b) $m_B = 2\,kg$
c) $m_C = 4\,kg$
d) $m_D = 6\,kg$

34) a) newton's second law
$F\cos\theta - mg\sin\theta = 0$

$F_a = 0 \Rightarrow F = 560\,N$

b) $F_N - F\sin\theta - mg\cos\theta = 0$
$\Rightarrow F_N = 1.132 \cdot 10^3\,N$

45) $m = \frac{2\,200}{9{,}8} = 225\,kg$
deceleration $a = \pm 2\,m/s^2$
$T - mg = ma \Rightarrow m(g+a) = T$
$T = 3{,}0 \cdot 10^4$
$\Rightarrow T - mg = ma = 225 \cdot 2 = 2{,}3 \cdot 10^3\,N$

51) $\sum F_2 = m_2 a_2$
$F_2 = m_2 g$
$T - m_1 g = m_1 a$
$m_2 g - T = m_2 a$
$a = \left(\frac{m_2 - m_1}{m_2 + m_1}\right) g$
$T = \left(\frac{2 m_1 m_2}{m_1 + m_2}\right) g$
a) with $m_1 = 13\,kg$ $m_2 = 24\,kg$
$a = \frac{11}{37} g \approx 3{,}0\,m/s^2$
b) similarly
$T = \frac{2(13)(24)}{13+24} g = 157\,N$

56) total $= 120\,kg$
$m_B = 8\,kg$ $m_A = 112\,kg$
$\Rightarrow a = \frac{20}{112} \cdot 8 = 2{,}9\,m/s$
$\Rightarrow$ second figure $= 60 \cdot a = 25\,m/s^2$
b) $F_a = (112\,kg)(2.80\,m/s^2) = 300\,N$

59) $T = mg = 15 \cdot 9{,}8 = 147\,N$
$a = \frac{T - mg}{m} = \frac{147 - 10 \cdot 9{,}8}{10}$
$= 4{,}9\,m/s^2$

b) apply newton's 2nd law
We have: $147 - T = 15\,a$
and: $T - 98 = 10\,a$
$a = 1{,}96\,m/s^2$

c) direction:
the monkey accelating upward as a result in part B

d) $a = 1{,}96\,m/s^2$
$T = 98 + 10 \cdot 1{,}96 = 117{,}6\,N$