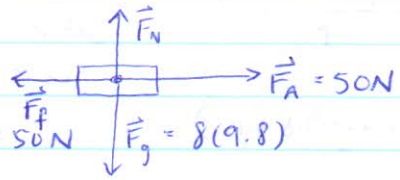
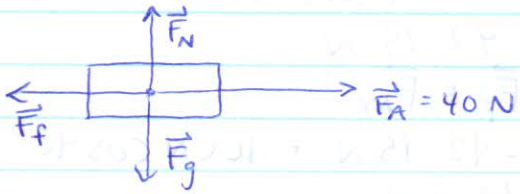
Dynamics Worksheet #1

① 

$\vec{F}_f = 50N = \mu_k \vec{F}_N \qquad \vec{F}_N = \vec{F}_g = 8(9.8)$

$\mu_k = \frac{\vec{F}_f}{\vec{F}_N} = \frac{50N}{8(9.8)} = 0.64$

② 

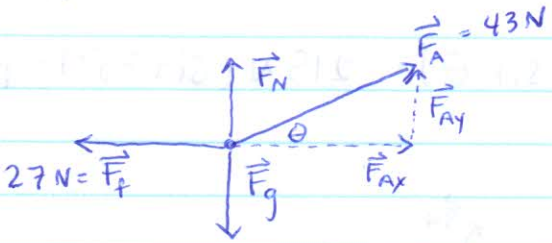
(a) $\sum F_x = \vec{F}_f + \vec{F}_A = ma = 5.0kg(6.0m/s^2)$

$\vec{F}_f = 5.0(6.0m/s^2) - 40N$

$= -10\ N$

(b) ~~$\vec{F}_A - \vec{F}_g = 5.0(9.8) =$~~

$\mu = \frac{\vec{F}_f}{\vec{F}_N} = \frac{-10N}{5(9.8)} = 0.204$

③ 

(a) $\vec{F}_f = -\vec{F}_{Ax}$

$27N = -43N\cos\theta$

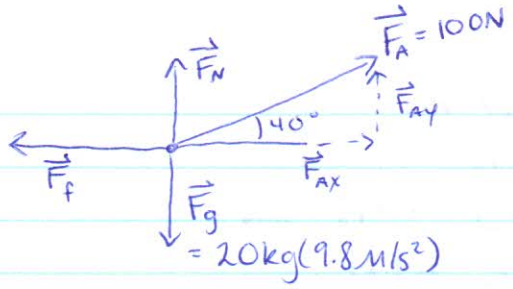
$\cos\theta = \frac{27}{43}$

$\theta = 51°$

(b) $\vec{F}_N + \vec{F}_{Ay} = \vec{F}_g \qquad \vec{F}_N = 18(9.8) - 43(\sin 51°)$

$= 143\ N$

④



$\mu_k = 0.32$
$a = ?$

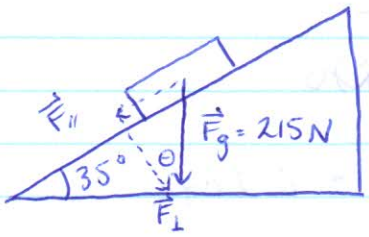
$$\sum F_x = ma$$

$$\vec{F}_f = \mu \vec{F}_N$$
$$= \mu (\vec{F}_g - \vec{F}_A \sin\theta)$$
$$= 0.32(20(9.8) - 100(\sin 40°))$$
$$= 42.15\ N$$

$$\sum F_x = \vec{F}_f + \vec{F}_{AX}$$
$$= -42.15\ N + 100N \cos 40°$$
$$= 34.5\ N$$

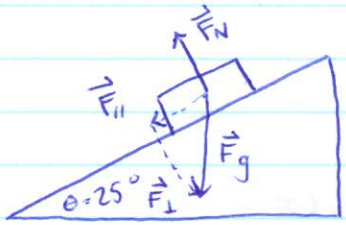
$$a = F/M = 34.5N/20kg = 1.73\ m/s^2$$

⑤



$$\vec{F}_{//} = \vec{F}_g(\sin\theta) = 215N(\sin 35°) = 123\ N$$

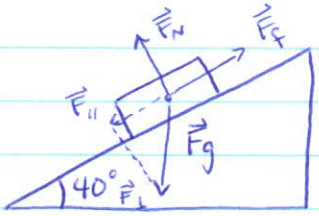
⑥



$$\vec{F}_{//} = \vec{F}_g(\sin 25°) = (6)(9.8)(\sin 25°) = 24.8\ N$$

$$a = \frac{F}{M} = \frac{24.8N}{6kg} = 4.1\ m/s^2$$

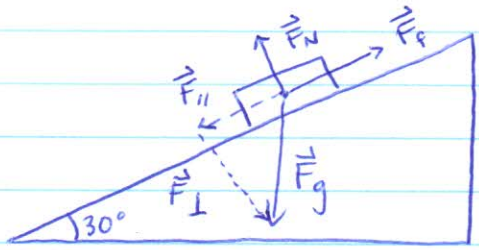
(7)



$\vec{F}_{||} = \vec{F}_f = \vec{F}_g \sin 40° = (200\,kg)(9.8\,m/s^2)\sin 40°$

$= 1260\,N$

(8)



$\mu_k = 0.15$

$a = ?$

$\sum \vec{F}_{dh} = \vec{F}_{||} + \vec{F}_f$

$\vec{F}_{||} = \vec{F}_g \sin\theta$

$= 50kg(9.8\,m/s^2)\sin 30°$

$= 245\,N$

$\vec{F}_f = \mu \cdot \vec{F}_N$

$\vec{F}_N = -\vec{F}\perp$

$= 50kg(9.8\,m/s^2)\cos 30°$

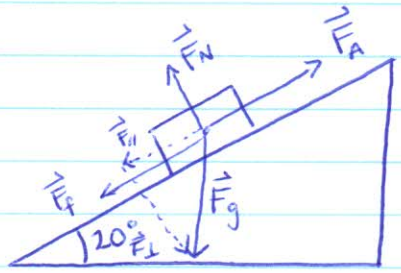
$= 424\,N$

$\vec{F}_f = 0.15(424\,N) = 63.6\,N$

$\sum \vec{F}_{dh} = 245\,N - 63.6\,N = 181.4\,N$

$a = F/M = 181.4\,N / 50kg = 3.6\,m/s^2$

(9)



$\vec{F}_g = 325\,N$

$\vec{F}_A = 211\,N$

(a) $\vec{F}_{||} = \vec{F}_g \sin 20°$

$= 325\,N(\sin 20°) = 111\,N$

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(b) $F = ma$

$a \neq 0$

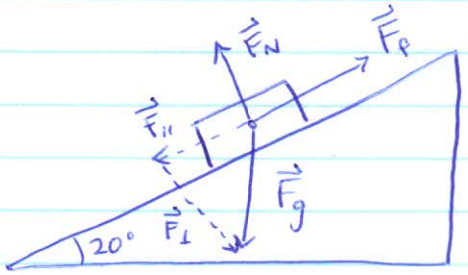
$\therefore \sum \vec{F}_{\parallel} = 0$

(c) $\vec{F}_f = \vec{F}_A - \vec{F}_{\parallel}$

$= 211\,N - 111\,N = 100\,N$ downslope

(d) $\mu = \dfrac{\vec{F}_f}{\vec{F}_N} = \dfrac{100\,N}{\vec{F}_g \cos\theta} = \dfrac{100\,N}{325N(\cos 20°)} = 0.33$

(10)



$\vec{F}_f = 100\,N$ upslope

$\sum F_{\parallel \text{ to plane}} = 0$

$\therefore \vec{F}_f = \vec{F}_A + \vec{F}_{\parallel}$

$\vec{F}_A = \vec{F}_f - \vec{F}_{\parallel} = 100N - 111N = -11N$

$\therefore$ 11 N up the slope