Force Review Sheet 16-17

1.) #1.) object @ rest stays @ rest, object in motion stays in motion
ex:) table cloth trick
#2.) Force & acceleration are directly related (if $\vec{F}\uparrow$ $\vec{a}\uparrow$)
Acceleration & mass are indirectly related (if $F_n\uparrow$ $\vec{a}\downarrow$
ex:) kick a soccerball & bowling ball with same force, soccerball accelerates more
#3.) For every force there is an equal & opposite force
ex:) car tire pushes on road, road pushes on car tire
* key point: the forces felt in a collision are the same, but the accelerations are different depending on mass

2.) inertia is resistance to change in motion so more mass = more inertia. The elephant has more inertia

3.) because if you stop pedaling $\Sigma\vec{F}$ is now acting backwards, so you slow down (no more applied force)

4.) Equilibrium occurs when $\Sigma\vec{F}=0$ ($\vec{a}=0$) → constant speed or @ rest

5.) $\vec{F}_{sf}$ acts opposite the direction of motion; as $\vec{F}_n\uparrow$ $\vec{F}_f\uparrow$

6.) $\vec{F}_n$ is the reaction force to an object on any surface, it acts perpendicular to the surface of contact

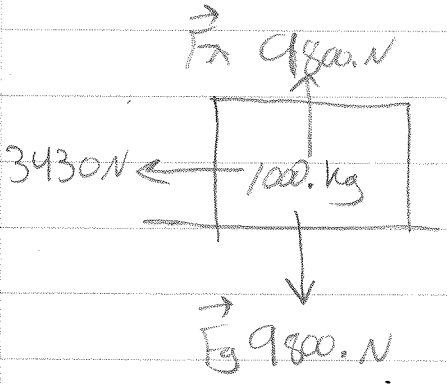
7.) Force is a push or pull on an object; $\Sigma\vec{F}$ is the sum of all forces acting on an object.

8.) ON

9.) yes, it just needs to be moving @ constant speed ($\vec{a}=0$ m/s^2)

10) a) person pushes on wall, wall pushes on person
b) club pushes ball, ball pushes club
c) hand pushes backwards on water, water pushes forward on hand

11)

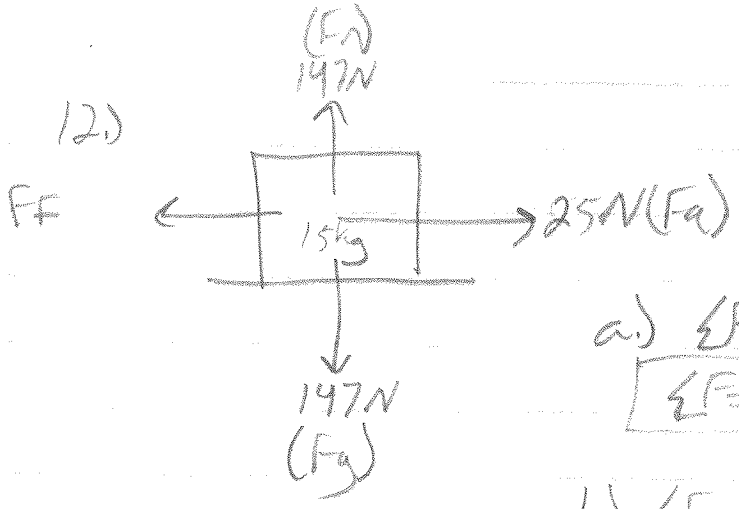


a) $\vec{F}_F = 3430\,N$

b) $\vec{a} = \frac{\Sigma \vec{F}}{m}$ * $\Sigma \vec{F} = \vec{F}_F$ as there is no applied force

$\vec{a} = \frac{3430\,N}{1000.\,kg}$ $\vec{a} = -3.4\,m/s^2$

12.)



a.) $\Sigma F = (15kg)(.75 m/s^2)$

$\boxed{\Sigma F = 11N}$

b.) $\Sigma F = Fa - Ff$

$11N = 25N - Ff$

$\boxed{Ff = 14N}$

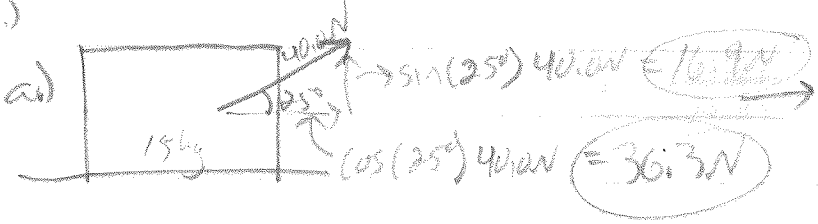
c.) $Ff = \mu \cdot Fn$

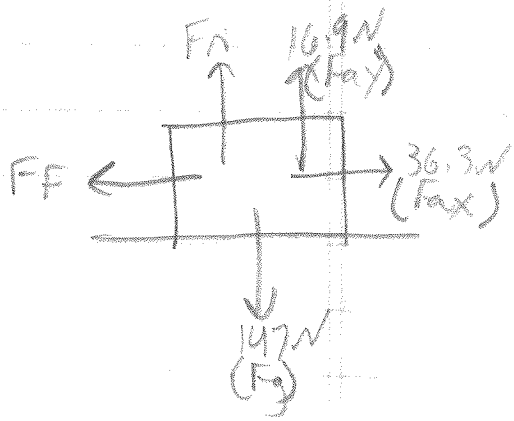
$14N = \mu \cdot 147N$

$\boxed{\mu = .095}$

13.)

a)





b) $Fg = Fay + Fn$

$147N = 16.9N + Fn$

$Fn = 130N$

c) $Ff = \mu \cdot Fn$

$Ff = (.080) \cdot 130N$

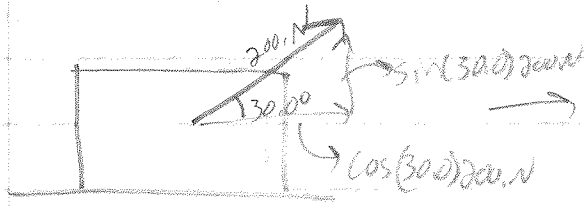
$Ff = 10.4N$

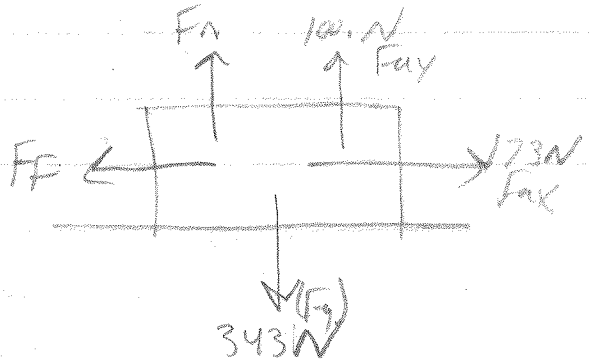
d.) $\Sigma F = Fax - Ff \rightarrow 36.3N - 10.4N = 25.9N$

$\Sigma F = ma$

$25.9N = (15kg)a$ $\boxed{a = +1.7 m/s^2}$

14.





a.) $F_F = 173\,N$

↳ since the bag is moving @ constant v, $\vec{a} = 0$, so $\Sigma F = 0$, meaning Fax & F_F are equal

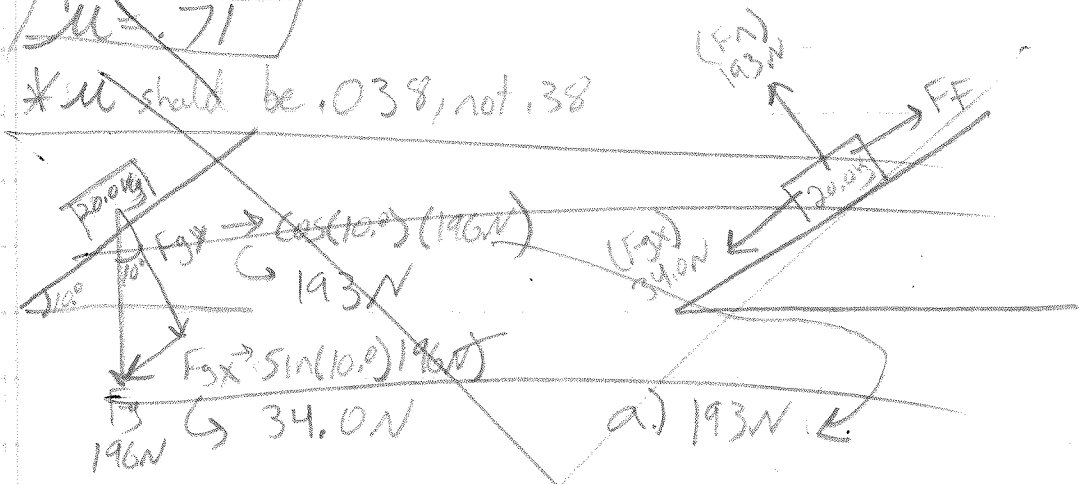
b.) $F_n \rightarrow F_g = F_{ay} + F_n \rightarrow 343\,N = 100.\,N + F_n$

$F_n = 243\,N$

$F_F = \mu \cdot F_n \rightarrow 173\,N = \mu \cdot 243\,N$

$\mu = .71$

15. *μ should be .038, not .38



a.) 193N

b) $F_F = \mu \cdot F_n \rightarrow F_F = .038 \cdot 193\,N = 7.33\,N$

c) $\Sigma F = F_{gx} - F_F$

↳ $\Sigma F = 34.0\,N - 7.33\,N$

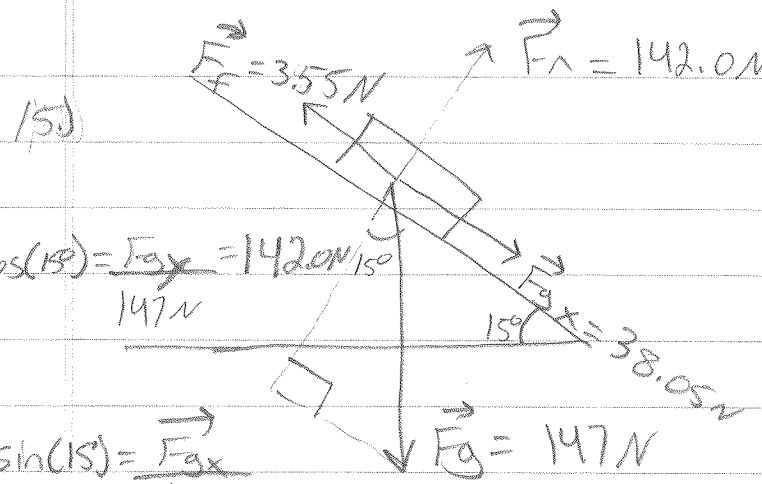
↳ $\Sigma F = 26.7\,N$

$\Sigma F = m \cdot a$

↳ $26.7\,N = (20.0\,kg)\,a$

$a = 1.33\,m/s^2$ down incline

15.)



$\cos(15°) = \frac{F_{gx}}{147N} = 142.0N$

$\sin(15°) = \frac{\vec{F}_{gx}}{147N}$

↳ $38.05N$

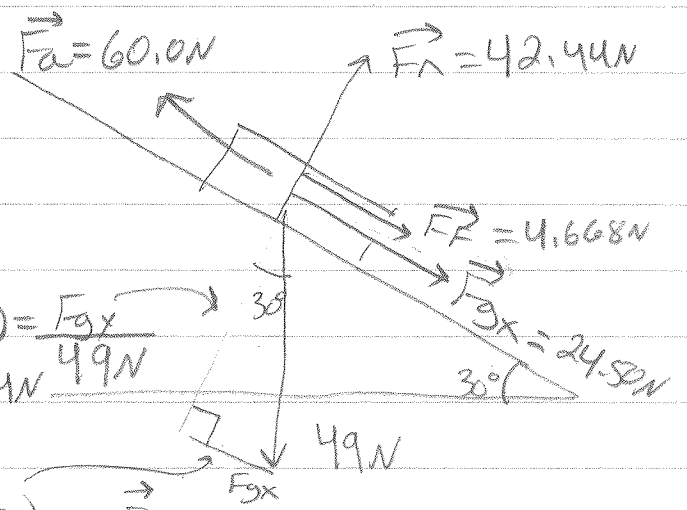
a) $\vec{F}_n = \vec{F}_{gx} = \boxed{142.0N}$

b) $\vec{F}_f = \mu_s \vec{F}_n = (.025)(142.0N) = \boxed{3.55N}$

c) $\Sigma \vec{F} = \vec{F}_{gx} - \vec{F}_f = 38.05N - 3.55N = 34.45N$

$\vec{a} = \frac{\Sigma \vec{F}}{m} = \frac{34.45N}{15kg} = \boxed{2.3\ m/s^2 \text{ down Incline}}$

16)



$\vec{F_F} = (.11)(42.44N)$

$\vec{F_F} = 4.668N$

$\cos(30.0) = \frac{F_{gx}}{49N}$

$\hookrightarrow = 42.44N$

$\sin(30°) = \frac{\vec{F_{gx}}}{49N}$

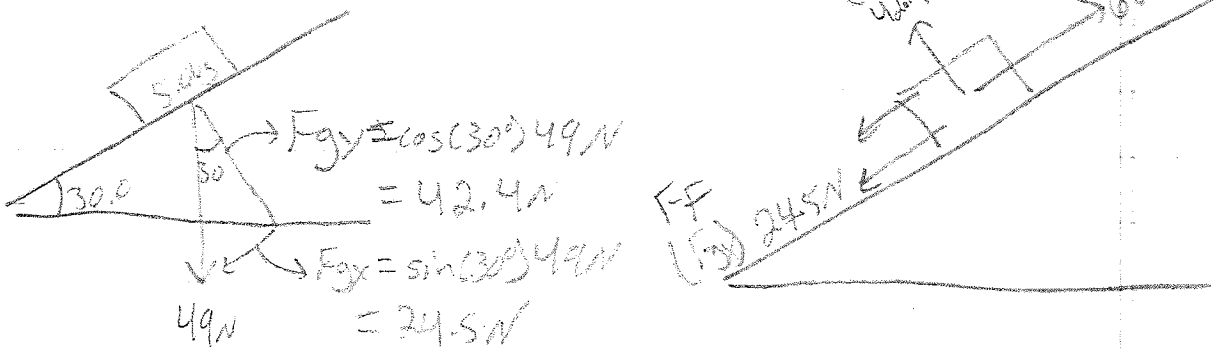
$\hookrightarrow 24.50N$

$\Sigma\vec{F} = \vec{F_a} - (\vec{F_F} + \vec{F_{gx}})$

$\Sigma\vec{F} = 60.0N - (4.668N + 24.50N) = 30.83N$

$\vec{a} = \frac{30.83N}{5.00kg} = 6.2\ m/s^2$ up incline

16)



$F_f = \mu \cdot F_n$

$F_f = .11 \cdot 42.9N = 4.72N$

$\sum F = F_a - F_{gx} - F_f$

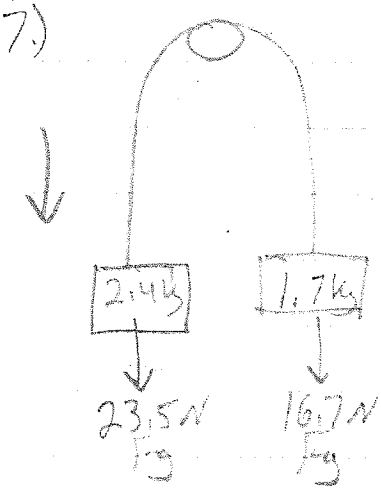
$\sum F = 60.0N - 24.5N - 4.72N$

$\sum F = 30.8N$

$\sum F = Ma \cdot a \longrightarrow 30.8N = 5.0kg \cdot a$

$a = 6.2 m/s^2$ up incline

17)



2.4kg mass pulls down side to heavier than 1.7kg

a) $\sum F = F_{g2.4} - F_{g1.7} \rightarrow 23.5N - 16.7N$

$\sum F = 6.8N$

$\sum F = ma \rightarrow 6.8N = 4.1kg\ a$ ($a = 1.7 m/s^2$)

(4.1kg with mass)

b)

$\sum F = 2.4kg \cdot 1.7 m/s^2$

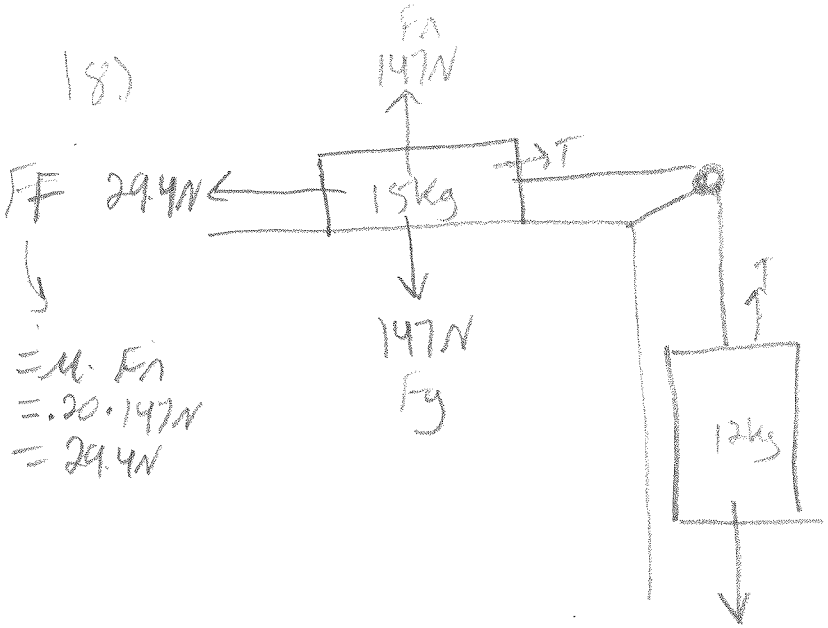
$\sum F = 4.08N$

$\sum F = F_g - T$

$4.08N = 23.5N - T$

$T = 19.4N \rightarrow 19N$

18)



$= \mu \cdot F_n$
$= .20 \cdot 147N$
$= 29.4N$

a.) $\Sigma F = F_{g_{12kg}} - F_F$

$\Sigma F = 118N - 29.4N$

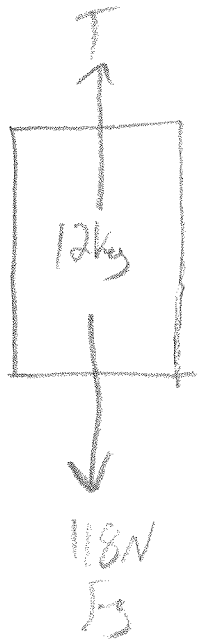
$= 88.6N$

$\hookrightarrow \Sigma F = ma$

$88.6N = (27kg)a$

$\vec{a} = 3.28 m/s^2$

b.)



$\Sigma F = ma$

$\Sigma F = (12kg)\ 3.28 m/s^2$

$\Sigma F = 39.4N$

$\Sigma F = F_g - T$

$39.4N = 118N - T$

$T = 78.6N$