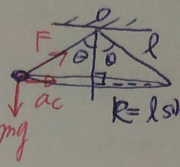
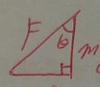
1.

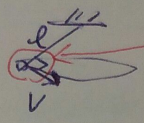




$a_c = g\tan\theta \rightarrow \frac{V^2}{R} = g\tan\theta$

$\rightarrow V = \sqrt{gR\tan\theta} = \sqrt{gl\sin\theta\tan\theta}$

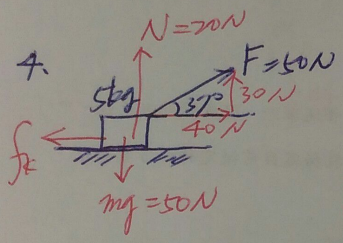
$\therefore L_{\perp} = [Rmv\sin 90^\circ] = lm\sqrt{gl\sin 37^\circ \tan 37^\circ}\sin 90^\circ$



(R v 夾角)

$= \sqrt{m^2 gl^3 \frac{3}{5}\frac{3}{4}} = \sqrt{\frac{9}{20}m^2 gl^3}$ #

4.



$f_k = \mu_k N = 0.8 \times 70 = 16[N]$

鉛直 (合力=0) $N = 50 - 30 = 70[N]$

水平 ($F = ma$) $40 - 16 = 5a$

$\rightarrow a = \frac{24}{5}[m/s^2]$

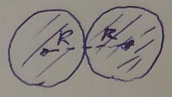
$[\Delta x = v_0 t + \frac{1}{2}at^2]$ $\Delta x = 0 + \frac{1}{2} \times \frac{24}{5} \times 5^2$

$= 60[m]$

$\therefore$ 拉作功平均功率 $\overline{P} = \frac{W}{\Delta t} = \frac{F\Delta x\cos 37^\circ}{\Delta t}$

$= \frac{50 \times 60 \times \frac{4}{5}}{5} = 480[W]$

5.



令球密度 D

則 球(個別)質量 $M = DV = \frac{4}{3}\pi R^3 D$

$\therefore F_g = \frac{GM^2}{(2R)^2} = \frac{G(\frac{4}{3}\pi R^3 D)^2}{4R^2} \propto R^4$ #

05.23.2016

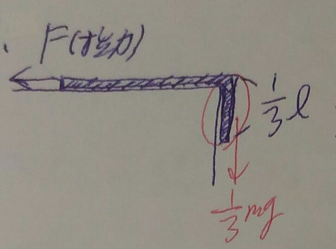
8. $W_{外力} = -W_{彈力} = -\left(\frac{1}{2}kx_1^2 - \frac{1}{2}kx_2^2\right)$

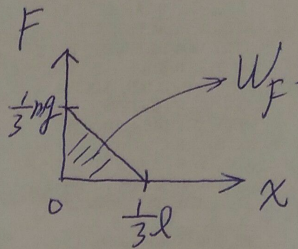
$= \frac{1}{2}kx_2^2 - \frac{1}{2}kx_1^2 = \frac{1}{2}\times 300 \times \left[\left(\frac{15}{100}\right)^2 - \left(\frac{5}{100}\right)^2\right]$

(末) (初)

$= 3\,[J]$ #

9. F(拉力)





$W_F = \frac{1}{2}\frac{1}{3}l\frac{1}{3}mg$

$= \frac{1}{18}mgl$ #

10.

(A) $\frac{GMm}{R^2} = m\frac{4\pi^2 R}{T^2} \rightarrow \frac{G D\frac{4}{3}\pi R^3}{R^2} = \frac{4\pi^2 R}{T^2}$

$\rightarrow T = \sqrt{\frac{3\pi}{D}} \propto \frac{1}{\sqrt{D}}$ $\left(\frac{1}{\sqrt{2}} : \frac{1}{\sqrt{1}} = 1 : \sqrt{2}\right)$ #

(B) 由(A) $\omega = \frac{2\pi}{T} \propto \sqrt{D}$ $(\sqrt{2} : 1)$ #

(C) 由(A) $v = \frac{2\pi R}{T} \propto R\sqrt{D}$ $(3\sqrt{2} : 1)$ #

(D) 由(A) $a_c = \frac{4\pi^2 R}{T^2} \propto RD$ $(3\times 2 : 1 = 6 : 1)$ #

(E) $F_C = F_g = ma_C$ ∵ m 不知 ∴ 不知 #

15. (A) $F_g = \frac{GMm}{R^2} = \frac{G\frac{4}{3}\pi R^3 D m}{R^2} \propto R$ (4倍) #

(B) $g = \frac{GM}{R^2} = \frac{G\frac{4}{3}\pi R^3}{R^2} \propto R$

$\rightarrow h = \frac{v_0^2}{2g} \propto \frac{1}{R}$ ($\frac{1}{4}$倍) #

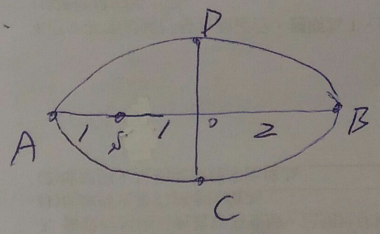
(C) 由(B) $t = \sqrt{\frac{2h}{g}} \propto \frac{1}{\sqrt{g}} \propto \frac{1}{\sqrt{R}}$ ($\frac{1}{\sqrt{4}} = \frac{1}{2}$倍) #

(D) 由(B) $v = \sqrt{2gh} \propto \sqrt{g} \propto \sqrt{R}$ ($\sqrt{4} = 2$倍) #

(E) $F_g = \frac{GMm}{r^2} = \frac{G\frac{4}{3}\pi R^3 m}{r^2} \propto R^3$ ($4^3 = 64$倍) #

r ← 月地距離不變

16.



(A) 克二: $r_A v_A = r_B v_B$

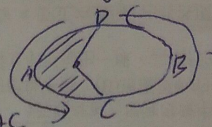
$1 v_A = 3 v_B$

$\therefore v_A : v_B = 3 : 1$ #

(B) 克二: $r_A^2 \omega_A = r_B^2 \omega_B$ $1^2 \omega_A = 3^2 \omega_B$ $\therefore \omega_A : \omega_B = 9 : 1$ #

(C) $a = g = \frac{GM}{r^2} \propto \frac{1}{r^2}$ $\therefore a_A : a_B = \frac{1}{1^2} : \frac{1}{3^2} = 9 : 1$ #

(D)



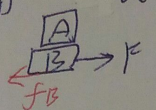
t_{DAC} T_{CBD}

由圖知掃過面積 DAC < CBD

$\therefore t_{DAC} < t_{CBD}$ #

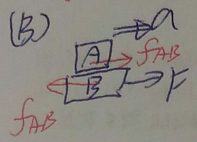
(E) A点 $a_T = 0$ #

17、

(A) 

$\because a=0 \therefore$ A、B間無摩擦力 #

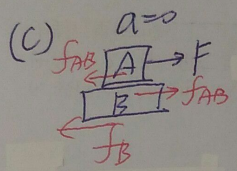
(但B与桌面有向左摩擦力 $f_B=F$) #

(B) 

A: ($F=ma$) $f_{AB}=m_A a$ 向右

B: f_{AB} 向左 $\overleftarrow{f_{AB}}$ 故

$\therefore f_{AB}$ 对B作負功 #

(C) 

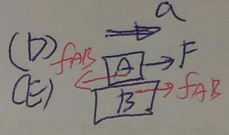
A: $a=0$ (合力=0)

$\therefore f_{AB}=F$ (向左) $\overleftarrow{f_{AB}}$ 故

$\therefore f_{AB}$ 对A作負功 #

[B: f_{AB} 对B作正功

B与桌面有摩擦力 $f_B=f_{AB}=F$ (←)]

(D)(E) 

B: ($F=ma$) {① 當地面光滑時 $f_{AB}=ma$ (向右)

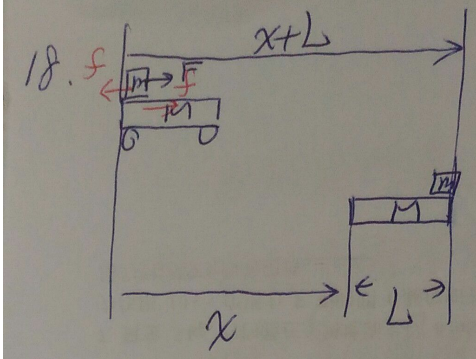
② 當地面粗糙時 $f_{AB}-f_B=ma$ (向右)

A: f_{AB} 向左 $\therefore f_{AB}$ 对A作負功 #

$\overleftarrow{f_{AB}}$ 故

05.23.2016

18.



由圖知 m 位移 $x+L$

M 位移 x

(A) m：功能定理 $W_{所有力}=\Delta K$

$W_F+W_f=\Delta K_m \rightarrow \Delta K_m = F(x+L)-f(x+L)$

$=(F-f)(x+L)$ #

$\left[\overrightarrow{F},\ \overleftarrow{f},\ \overrightarrow{\Delta x_m}=x+L\right]$

(B) M：功能定理 $W_{所有力}=\Delta K$

$W_f=\Delta K_M \rightarrow \Delta K_M = +fx$ #

$\left[\overrightarrow{f},\ \overrightarrow{\Delta x_M}=x\right]$

(C) $\Delta K_m+\Delta K_M=(F-f)(x+L)+fx$

$=Fx+FL-fL$ #

(D) $W_f(m)+W_f(M)=-f(x+L)+fx$

$=-fL$ #

(E) 不一定 #

20.

(A) 動能是純量#

(B) 動能守恆(不變)，但方向可能會變

如：等速圓周#