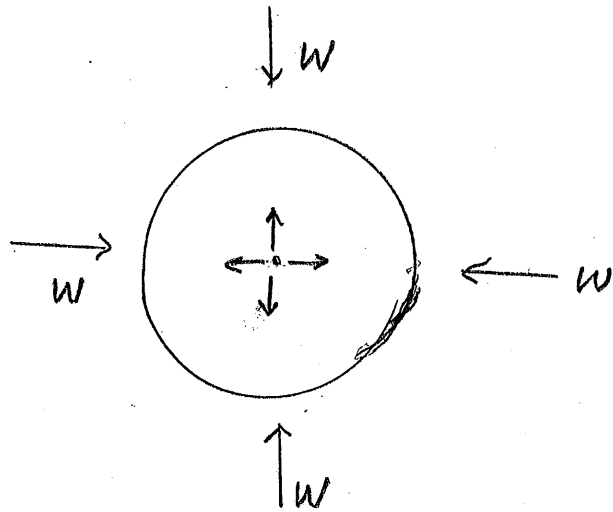


Answers – Week 4

4-1. Essay!

4-3. By Newton's 3<sup>rd</sup> Law, if the Earth pulls on you, you must pull on Earth with the force of same magnitude but opposite in direction. All the forces are along  $-\hat{r}$  so reaction must be along  $+\hat{r}$  acting at centre of Earth.



[Note: DON'T CONFUSE WITH REACTION FORCE IF YOU ARE STANDING ON THE EARTH]

4-5.  $\equiv m$  along incline

$$F_{SP} - Mg \sin \theta = 0$$

$$F_{SP} = Mg \sin \theta$$

$$= k \Delta \ell$$

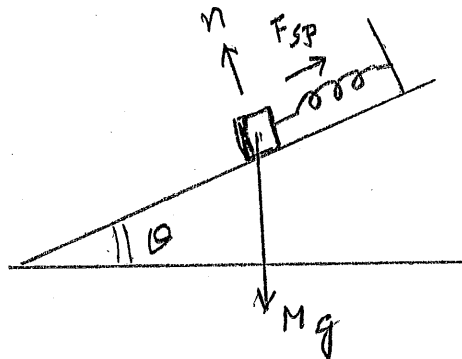
$$\Delta \ell = \frac{Mg \sin \theta}{k}$$

$$= \frac{100 \times 9.8 \times 0.5}{10^4} = 4.9 \times 10^{-2} \text{ m}$$

$$\equiv m \text{ perp. to incline } n - Mg \cos \theta = 0,$$

$$n = 100 \times 9.8 \times 0.866 = 849 \text{ N}$$

$$a = g \sin \theta = 4.9 \text{ m/s}^2 \text{ down the incline}$$



4-7. Speed is const. mass in  $\equiv m$ .

$$n + F \sin 30 - Mg = 0$$

$$F \cos \theta - \mu_k n = 0$$

$$\mu_k = \frac{F \cos 30}{Mg - F \sin 30} = 0.44$$

If  $\mu_s = 0.5$ , block will not move.

4-9. (i) 2450 N

(ii) 12,250 N

4-11. (i)  $W = 60 \times 9.8 = 588 \text{ N}$

(ii)  $W = 588 \text{ N}$

(iii)  $W = 600 \text{ N}$

$$(N - Mg) \hat{y} = M \underline{a}$$

(iv)  $W = 576 \text{ N}$

$$4-13. \quad \tan \theta = \mu_s \\ \theta = 26.6^\circ$$

$$4-15. \quad a = \frac{M_1 - M_2}{M_1 + M_2} g = \frac{g}{3} = 3.27 \text{ m/s}^2 \\ \Delta y = \frac{1}{2} a t^2 = \frac{1}{2} \times 3.27 \times 4 = 6.54 \text{ m}$$