1. (a) $\lambda = 2$

① Checking both days: $E(1) = E(2) = \frac{1}{3}u(2000) + \frac{2}{3}u(-1000)$

$$= \frac{2000}{3} + \frac{2}{3} \times (-2000)$$

$$= -\frac{2000}{3}$$

$$E(1+2) = 2 \times \left(-\frac{2000}{3}\right) = -\frac{4000}{3}$$

② checking at end of second day

4 chances $\begin{cases} \uparrow \ \uparrow \\ \uparrow \ \downarrow \\ \downarrow \ \uparrow \\ \downarrow \ \downarrow \end{cases}$

$$E(\text{day}2) = \frac{1}{3} \times \frac{1}{3} \times u(2000+2000) + \frac{1}{3} \times \frac{2}{3} \times u(1000)$$

$$+ \frac{2}{3} \times \frac{1}{3} \times u(1000) + \frac{2}{3} \times \frac{2}{3} \times u(-2000)$$

$$= \frac{4000}{9} + \frac{2000}{9} + \frac{2000}{9} + \frac{-16000}{9}$$

$$= -\frac{8000}{9}$$

$\because -\frac{8000}{9} > -\frac{4000}{3}$

$\therefore$ Carter is better off checking at the end of the second day

(b) In mental accounting, the loss also looms larger than gains and the framing matters $\because \frac{2000}{3} = 1000 \times \frac{2}{3}$

And checking every day is an example of "Myopic loss aversion", so Carter should always avoid checking everyday

Thus, no value of $\lambda$ would make Carter better off from checking the portfolio everyday.

2. (a) $\because P_t + S_t \le 40 \quad t \in \{1, 2\} \quad T = (S_1 + S_2)^2$

$$\therefore U = \log(40 - S_1 - P_F) + \log(40 - S_2 - P_F) + \log(S_1 + S_2)^2$$

$$\left.\begin{aligned} \text{FOC in } S_1 &= -\frac{1}{40 - S_1 - P_F} + \frac{2}{S_1 + S_2} = 0 \\ \text{FOC in } S_2 &= -\frac{1}{40 - S_2 - P_F} + \frac{2}{S_1 + S_2} = 0 \end{aligned}\right\} \Rightarrow \left.\begin{aligned} 80 - 2S_1 - 2P_F &= S_1 + S_2 \\ 80 - 2S_2 - P_F &= S_1 + S_2 \end{aligned}\right\}$$

$\therefore S_1^*$ must equals to $S_2^*$

$$\therefore 80 - 2S_1 - 2P_F = 2S_1$$

$$80 - 2P_F = 4S_1$$

$$\begin{cases} 20 - \frac{1}{2}P_F = S_1^* = S_2^* \\ \therefore P_1^* = P_2^* = 40 - \left(20 - \frac{1}{2}P_F\right) = 20 + \frac{1}{2}P_F \end{cases}$$

(b) $\because p_1^* = p_2^* = 20 + \frac{1}{2}P_F$

$\because P_F = 10 \quad \therefore p_1^* = p_2^* = 20 + \frac{1}{2} \times 10 = 25$ hrs

$\& \ S_1^* = S_2^* = 20 - \frac{1}{2} \times 10 = 15$ hrs

(c) Because the optimal party hours choices are "$20 + \frac{1}{2}P_F$", which means the choices of party hours is affected by friends (peers). Specifically as friends go to more parties, Bruce will spend less time in study and more time in parties.

Then, from the utility function, it is obvious that as $P_F$ increases, the utility for Bruce will decrease. Thus, it is a negative peer effects for Bruce.

(d) $\because P_1^* = P_2^* = 20 + \frac{1}{2}P_F \quad S_1^* = S_2^* = 20 - \frac{1}{2}P_F$

① living in M: when $P_F = 20$ at 0.7 & $P_F = 0$ at 0.3

$$U = \log(40 - S_1 - P_F) + \log(40 - S_2 - P_F) + \log(S_1 + S_2)^2$$

$$= \log(P_1 - P_F) + \log(P_2 - P_F) + 2\log(S_1 + S_2)$$

$$\therefore E(U) = 0.7 \cdot [\log(30-20) + \log(30-20) + 2 \times \log(10+10)]$$

$$+ 0.3 \cdot [\log(20-0) + \log(20-0) + 2\log(20+20)]$$

$$= 0.7 \times (2\log 10 + 2\log 20) + 0.3 [2\log 20 + 2\log 40)$$

$$= 3.22 + 1.74 = 4.96$$

② Living in D: when $P_F = 15$ at 0.5 & $P_F = 10$ at 0.5

$$E(U) = 0.5 [\log(27.5 - 15) + \log(27.5 - 15) + 2\log(12.5 + 12.5)]$$

$$+ 0.5 [\log(25 - 10) + \log(25 - 10) + 2\log(15 + 15)]$$

$$= 0.5 (2\log(12.5) + 2\log(25)] + 0.5 (2\log(15) + 2\log(30)]$$

$$= 2.495 + 2.6532$$

$$= 5.1482$$

$\because 5.1482 > 4.96 \quad \therefore$ Bruce should live in dorm