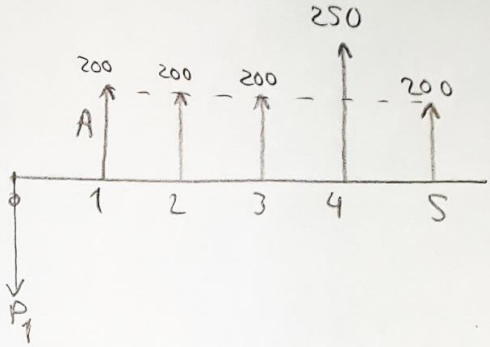
Assignment#1 Solutions

Question 1: (11 points)

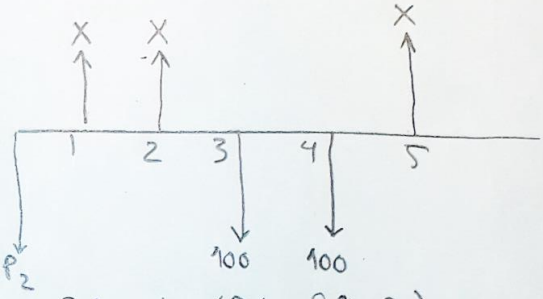
Using present worth



$$P_1 = 200(P/A, 8\%, 5) + (250-200)(P/F, 8\%, 4)$$

$$= 200(3.993) + 50(0.735)$$

$$= 835.35 \quad (4 \text{ points}) \square$$



$$P_2 = X(P/A, 8\%, 2) + X(P/F, 8\%, 5) - 100(P/A, 8\%, 2) * (P/F, 8\%, 2)$$

$$= X(1.783) + X(0.6806) - 100(1.783)(0.8573)$$

$$= 2.4636X - 152.856 \quad (6 \text{ points}) \square$$

$$P_1 = P_2 \Rightarrow 2.4636X - 152.856 = 835.35$$

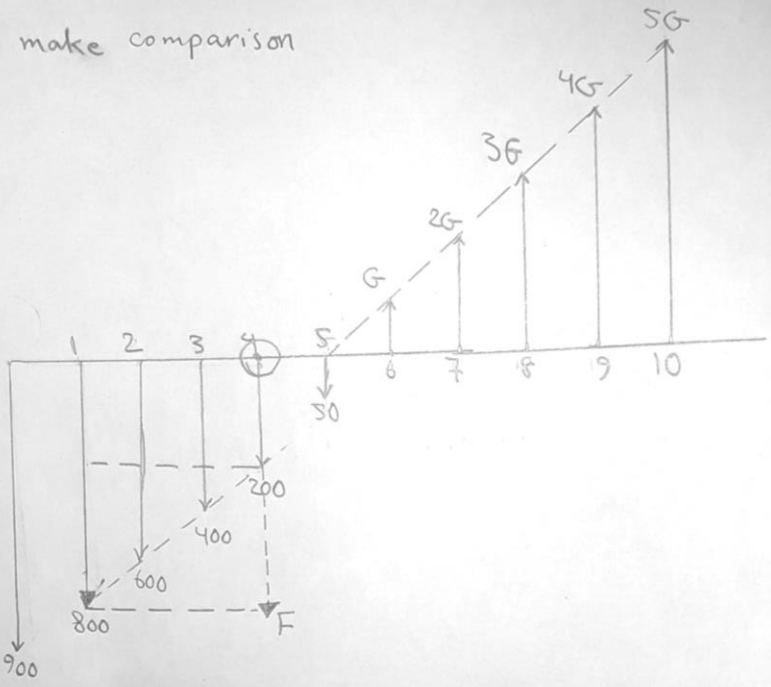
$$\Rightarrow X = 407.12 \quad \square \quad (1 \text{ point})$$

Question 2: (12 points)

Deposit = withdrawal

Select a year to make comparison

$n = 4$



Deposit at $n=4$

$$D = 800(F/A, 8\%, 4) - 200(P/G, 8\%, 4)(F/P, 8\%, 4) + 900(F/P, 8\%, 4) + 50(P/F, 8\%, 1)$$

$$D = 800(4.506) - 200(4.650)(1.36) + 900(1.36) + 50(0.9259)$$

$D = 3610.3$ (8 points) ☐

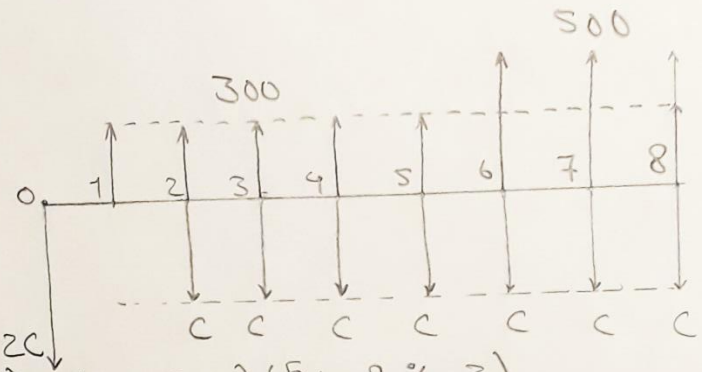
Withdrawal at $n=4$

$W = G(P/G, 8\%, 6) = G(10.523)$ (3 points) ☐

$W = D \Rightarrow G = 343.09$ ☐

(1 point)

Question 3 (12 points)



$$\text{Inflow} = 300(F/A, 8\%, 8) + (500-300)(F/A, 8\%, 3)$$

$$= 300(10.637) + 200(3.246) = 3840.3 \square \quad (5 \text{ points})$$

$$\text{Outflow} = 2C(F/A, 8\%, 8) + C(F/A, 8\%, 7)$$

$$= 2C(1.851) + C(8.923) \square \quad (5 \text{ points})$$

$$\text{Inflow} = \text{Outflow} \Rightarrow C = 304.18 \square$$

(2 points)

Question 4: (10 points)

$P = 30,000 \quad n = 3 \quad F = ?$

a) $i = 0.12 \Rightarrow F = P(1+i)^n = 30,000(1.12)^3$

$F = 42,147.84$ ☐ (4 points)

b) $r = 0.1175$, $k = \frac{1}{3}$

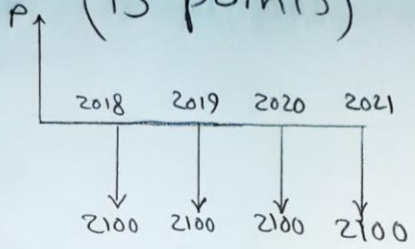
$F = Pe^{r/k} = 30,000\, e^{(0.1175)(3)}$

$F = 42,678.59$ ☐ (4 points)

First schedule should be accepted ☐ (2 points)

Question 5: (15 points)

a)



□ (2 points)

b) $i = 5.5\%$

$$P = A\left(P/A, i, n\right) = A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$$

$$P = 2100\left[\frac{(1+0.055)^4 - 1}{0.055(1+0.055)}\right] \Rightarrow P = 7360.8 \quad \square \text{ (4 points)}$$

c) Assume $i = 18$

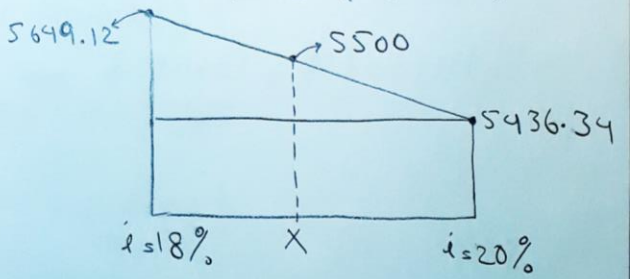
$$P = A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right] = 2100\left[\frac{(1+0.18)^4 - 1}{0.18(1+0.18)^4}\right]$$

$$P = 5649.12 \quad \square \text{ (3 points)}$$

Assume $i = 20$

$$P = 2100\left[\frac{(1+0.2)^4 - 1}{0.2(1+0.2)^4}\right] \Rightarrow P = 5436.34 \quad \square \text{ (3 points)}$$

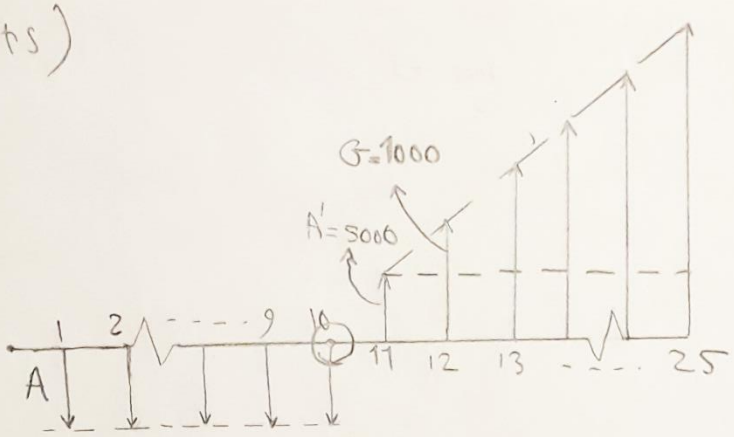
Using Interpolation



$$\frac{5649.12 - 5436.34}{18 - 20} = \frac{5500 - 5436.34}{X - 20}$$

$$\Rightarrow X = 19.4 \quad \square \quad \text{(3 points)}$$

Question 6: (13 points)



Amount invested = $F_{A,i,10} = A\left[\frac{(1+i)^n - 1}{i}\right]$
at $n = 10$

$= A\left[\frac{(1+0.06)^{10} - 1}{0.06}\right] = 13.1808\,A$ □ (6 points)

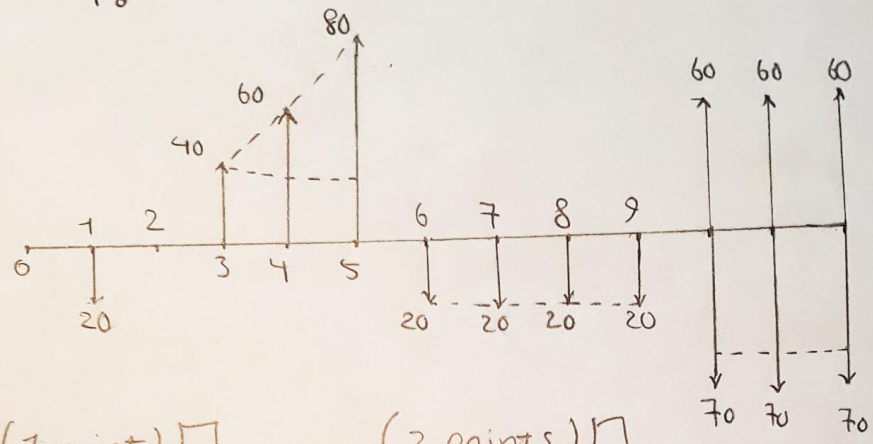
Withdrawal = $P_{A',i,15} + P_{G,i,10} = A'\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right] + G\left[\frac{(1+i)^n - in - 1}{i^2(1+i)^n}\right]$
at $n = 10$

$= 5000\left[\frac{(1+0.06)^{15} - 1}{0.06(1+0.06)^{15}}\right] + 1000\left[\frac{(1+0.06)^{15} - 0.006*15 - 1}{0.06^2(1+0.06)^{15}}\right]$

$= 106115.8$ □ (6 points)

$\Rightarrow 13.1808\,A = 106115.8 \Rightarrow A = 8050.79$ □
(1 point)

Question 7: (15 points)



(1 point) □ (2 points) □

$P = -20(P/F, 10\%, 1) + 40(P/A, 10\%, 3)(P/F, 10\%, 2)$

$+ 20(A/G, 10\%, 3)(P/A, 10\%, 3)(P/F, 10\%, 2)$ → (3 points) □

$-20(P/A, 10\%, 4)(P/F, 10\%, 5) - 10(P/A, 10\%, 3)(P/F, 10\%, 9)$

→ (3 points) □ → (3 points) □

$P = -20(P/F, 10\%, 1) + 40(P/A, 10\%, 3)(P/F, 10\%, 2)\left[1 + 0.5(A/G, 10\%, 3)\right]$

$-20(P/A, 10\%, 4)(P/F, 10\%, 5) - 10(P/A, 10\%, 3)(P/F, 10\%, 9)$

$P = -20(0.9091) + 40(2.487)(0.8264)\left[1 + 0.5(0.937)\right]$

→ (2 points) □

$-20(3.170)(0.6209) - 10(2.487)(0.4241)$

$P = 52.63$ □ (1 point)

Question 8: (12 points)

a) X = number of visitors

Total Costs (Tugger) = $\$15000 + \$2.80X$ (2 points) ☐

Total Costs (Buzzer) = $\$5000 + \$5X$ (2 points) ☐

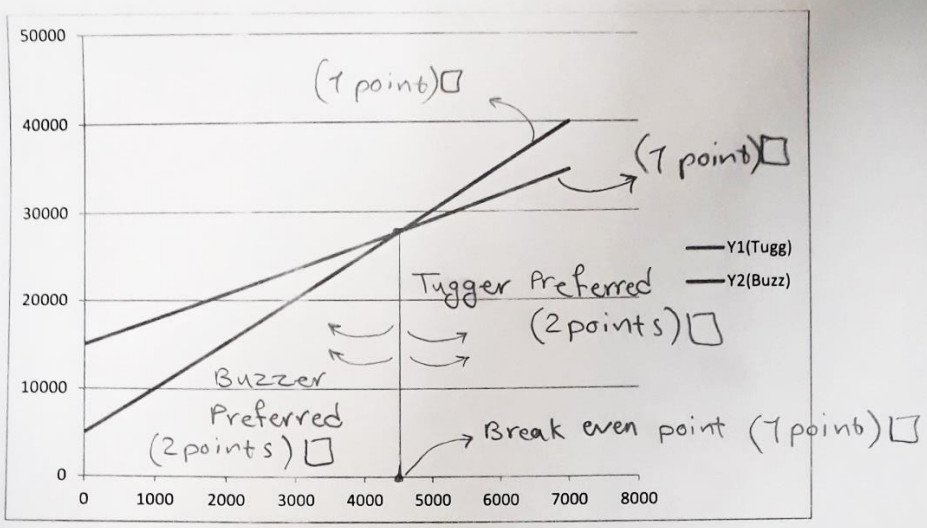
Break even when: Total Costs(Tugger) = Total costs(Buzzer)

$\$15000 + \$2.80X = \$5000 + \$5X$

$\Rightarrow X = 4546$ visitors is the the break even quantity ☐ (1 points)

b)

X	Y_1 (Tugg)	Y_2 (Buzz)
0	15,000	5,000
3000	23400	20000
7000	34600	40000



$Y_1 = 15000 + 2.8X$, $Y_2 = 5000 + 5X$