Assignment 3

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(1)

Gardens		✓		✓	✓	✓	✓	✓			✓					
Tables & Benches		✓	✓		✓	✓			✓	✓						
Cobblestones		✓	✓	✓	✓					✓	✓		✓			
One way		✓	✓	✓		✓		✓				✓	✓			
Possible	X			X				X		X	X	X				

There are 6 possibilities

1. No change
2. Gardens, cobblestones, and one way
3. Gardens and one-way
4. Tables, Benches, and Cobblestones
5. Cobblestones only
6. One way only
7. Cobblestone and one-way

(2) a) $P_1 = \frac{200000}{30000} = 6.\overline{6}$ years

$P_2 = \frac{100000}{13000} = 7.69$ years

Since Pretty Paver has a quicker payback period, it would be preferred

b) $AW_1 = -200000(A/P, 0.1, 10) + 30000$, $(A/P, 0.1, 10) = \frac{0.1(1.1)^{10}}{(1.1)^{10}-1}$

$= -32549.08 + 30000$

$= \$-2549.08$

$= 0.162745394$

$AW_2 = -100000(A/P, 0.1, 20) + 13000$, $(A/P, 0.1, 20) = \frac{(0.1)(1.1)^{20}}{1.1^{20}-1}$

$= -11745.96 + 13000$

$= \$1254.04$

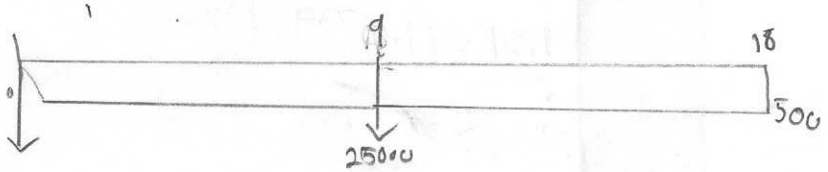
$= 0.117459624$

Since Paving Perfection has a higher annual worth, it would be preferred

c) No, the brothers prefer different pavers. The first brother's rational is that the investment into Pretty Paver will return the money spent quicker. The second brother's rational is that Paving Perfection would generate a return greater than the MARR over its service life, and that Perfect Paver would not. Depending on the size of the business and available capital, either approach is valid.

(3)

a)



$P_A = 25000 + 500(P/A, 0.1, 18) + 25000(P/F, 0.1, 9)$

$= 25000 + 500\left[\frac{(1.1)^{18}-1}{0.1(1.1)^{18}}\right] + \frac{25000}{(1+0.1)^9}$

$= -39703.15$

P_B, by observation, initial cost B > Combined Cost for A over 18 years

∴ A preferred

b) $P_A = -25000 - 500(P/A, 0.1, 9)$, $(P/A, 0.1, 9) = \frac{(1.1)^9 - 1}{0.1(1.1)^9} = 5.759023811$

$= -25000 - 2879.51$

$= -27879.51$

$P_B = -40000 - 300(P/A, 0.1, 9) + 35000(P/F, 0.1, 9)$

$= -40000 - 300\left(\frac{1.1^9 - 1}{0.1(1.1)^9}\right) + \frac{35000}{1.1^9}$

$= -41727.71 + 14843.42$

$= -26884.29$

∴ Cost of B lower over 9 years due to salvage value, B preferred.

c) No, they don't. The first rational is that roller A is cheaper over 18 years, assuming no salvage value. The second acknowledges a salvage value such that the other is cheaper. Both arguments are valid

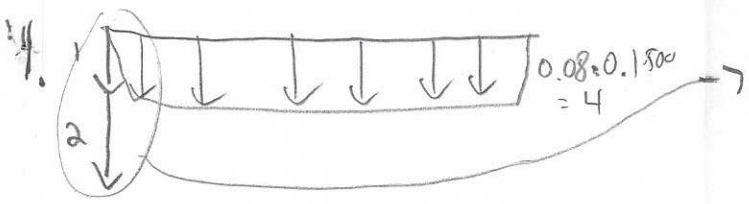
d) $-27879.51 \geq -41727.71 + \frac{SV}{1.1^9}$

$13848.2 \geq \frac{SV}{1.1^9}$

$32653.33 \geq SV$

∴ $SV \in 0 \leq SV < 32653.33$

(4) $AW_1 = AW_2$



$-3(A/P, 0.01, 2) - \frac{(500 \cdot 0.1 \cdot 0.08)}{4}$

$-500 \cdot 0.09 \cdot 0.08 = -3.6$

$AW_1 = -5(A/P, 0.01, N) - 3.6$ $\quad AW_2 = -3(A/P, 0.01, 2) - 4$

$AW_2 > AW_1$ ∴

$$-5\left[\frac{0.01(1.01)^N}{(1.01)^N - 1}\right] - 3.6 = -3\left[\frac{0.01(1.01)^2}{(1.01)^2 - 1}\right] - 4$$

$$-5\left[\frac{0.01(1.01)^N}{1.01^N - 1}\right] = -1.922537313$$

$$\frac{0.01(1.01)^N}{1.01^N - 1} = 0.384507462$$

$$0.01(1.01)^N = 0.384507462(1.01)^N - 0.384507462$$

$$-0.374507462(1.01)^N = -0.384507462$$

$$1.01^N = 1.026701736$$

$$N = \frac{\ln(1.026701736)}{\ln(1.01)}$$

$N = 2.648300478$ months $* \frac{500 \text{ hours}}{\text{month}}$

$= 1324.15$ hrs, 1325 hrs required