SOLUTIONS TO SELECTED PROBLEMS

Student: You should work the problem completely before referring to the solution.

CHAPTER 18

Solutions included for problems: 1, 4, 7, 10, 13, 16, 19, 22, 25, 29, 31, and 34

18.1 10 tons/day: $PW = -62{,}000 + 1500(P/F,10\%,8) - 0.50(10)(200)(P/A,10\%,8) - 4(8)(200)(P/A,10\%,8)$
$= \$-100{,}779$
20 tons/day: PW = $–140,257
30 tons/day: PW = $–213,878

18.4 $PW_{Build} = -80{,}000 - 70(1000) + 120{,}000(P/F,20\%,3)$
$= \$-80{,}556$

$PW_{Lease} = -(2.5)(12)(1000) - (2.50)(12)(1000)(P/A,20\%,2)$
$= \$-75{,}834$
Lease the space.

New construction cost = 70(0.90) = $63 and lease at $2.75

$PW_{Build} = \$-73{,}556$
$PW_{Lease} = \$-83{,}417$

Select build. The decision is sensitive.

18.7 (a) Breakeven number of vacation days per year is x.

$AW_{cabin} = -130{,}000(A/P,10\%,10) + 145{,}000(A/F,10\%,10) - 1500 + 150x - (50/30)(1.20)x$

$AW_{trailer} = -75{,}000(A/P,10\%,10) + 20{,}000(A/F,10\%,10) - 1{,}750 + 125x - [300/30(0.6)](1.20)x$

$AW_{cabin} = AW_{trailer}$

x = 19.94 days (Use x = 20 days per year)

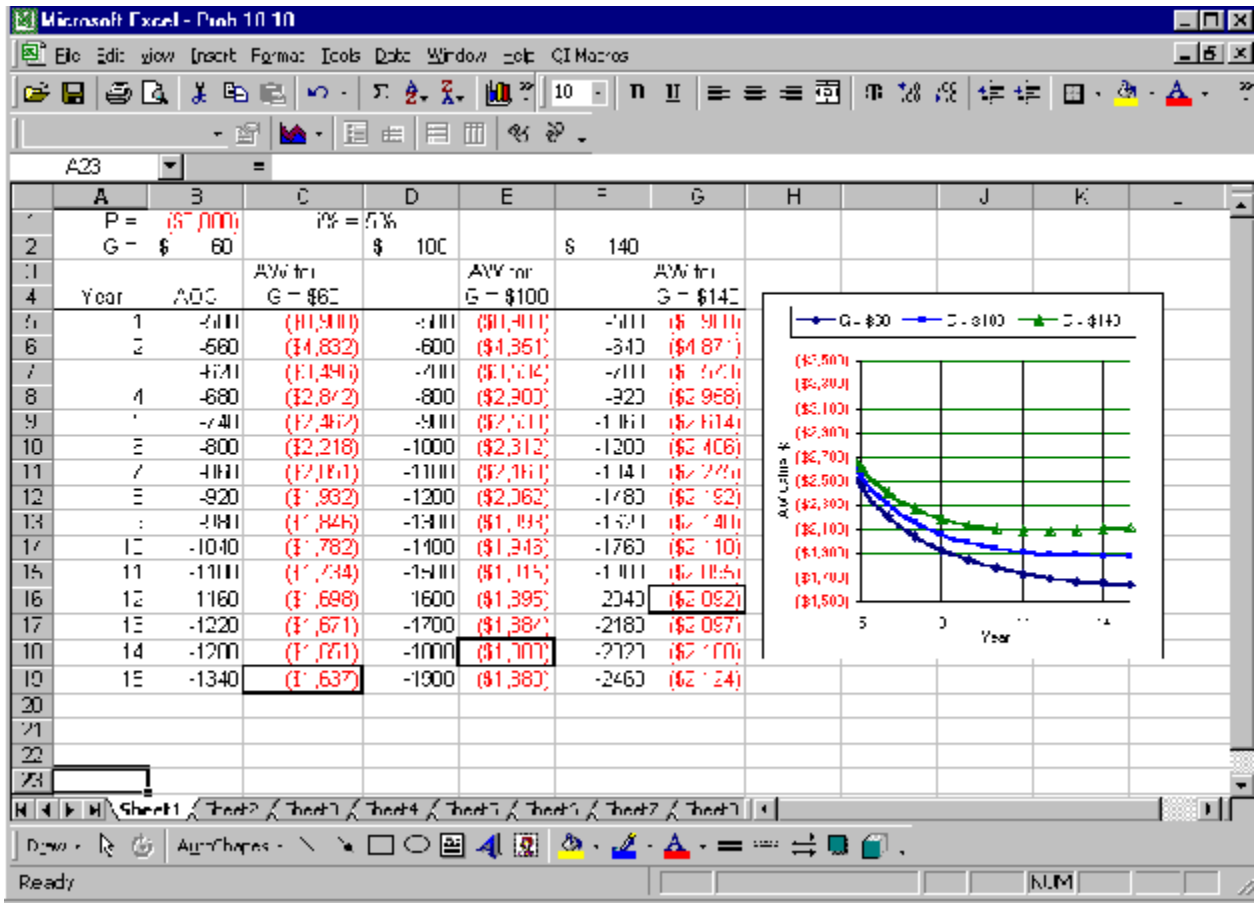
(b) Determine AW for 12, 16, 20, 24, and 28 days.

$AW_{cabin} = -13{,}558.75 + 148x$ $AW_{trailer} = -12{,}701.25 + 105x$

Days, x	AW_{cabin}	$AW_{trailer}$	Selected
12	$-11,783	$-11,441	Trailer
16	-11,191	-11,021	Trailer
20	-10,599	-10,601	Cabin
24	-10,007	-10,181	Cabin
28	- 9415	- 9761	Cabin

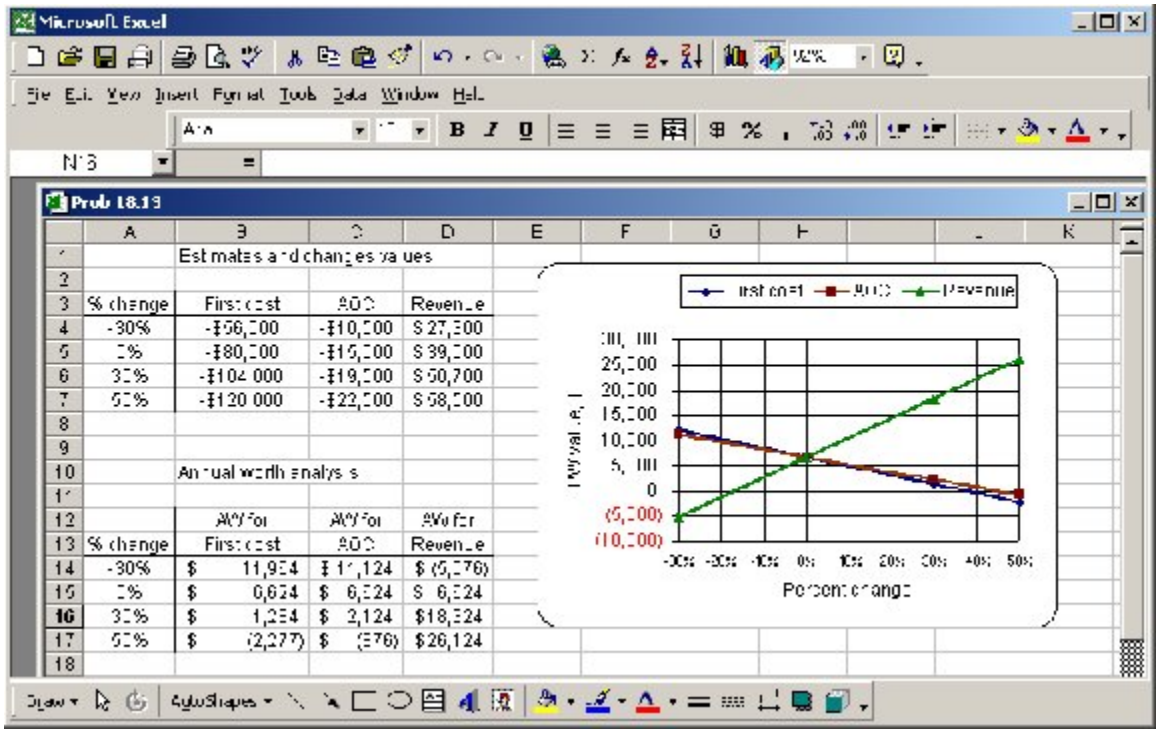
Each pair of AW values are close to each other, especially for x = 20.

18.10 For spreadsheet analysis, use the PMT functions to obtain the AW for each n value for each G amount.



The AW curves are quite flat; there are only a few dollars difference for the various n values around the n* value for each gradient value.

18.13 (a) First cost sensitivity: AW = –P(0.22251) + 24,425
(b) AOC sensitivity: AW = –AOC + 21,624
(c) Revenue sensitivity: AW = –32,376 + Revenue



18.16 Water/wastewater cost = (0.12 + 0.04) per 1000 liters = 0.16 per 1000 liters

Spray Method

Pessimistic - 100 liters

Water required = 10,000,000(100) = 1.0 billion
AW = –(0.16/1000)(1.00 X 10^9) = $–160,000

Most Likely - 80 liters

Water required = 10,000,000(80) = 800 million
AW = –(0.16/1000)(800,000,000) = $–128,000

Optimistic - 40 liters

Water required = 10,000,000(40) = 400 million
AW = –(0.16/1000)(400,000,000) = $–64,000

Immersion Method

AW = –10,000,000(40)(0.16/1000) – 2000(A/P,15%,10) – 100 = $–64,499

Immersion method is cheaper, unless optimistic estimate of 40 L is the actual.

18.19 (a) E(time) = (1/4)(10 + 20 + 30 + 70) = 32.5 seconds

(b) E(time) = 20 seconds
The 70 second estimate does increase the mean significantly.

18.22 E(i) = 103/20 = 5.15%

18.25 E(revenue) = $222,000

$$E(AW) = -375{,}000(A/P,12\%,10) - 25{,}000[(P/F,12\%,4) + (P/F,12\%,8)](A/P,12\%,10) - 56{,}000 + 222{,}000$$
$$= \$95{,}034$$

Construct mock mountain.

18.29 AW = annual loan payment + (damage) x P(rainfall amount or greater)
Subscript on AW indicates the rainfall amount.

$AW_{2.00}$ = $–42,174

$AW_{2.25}$ = $–35,571

$AW_{2.50}$ = $–43,261

$AW_{3.00}$ = $–54,848

$AW_{3.25}$ = $–61,392

Build a wall to protect against a rainfall of 2.25 inches with an expected AW of $–35,571.

18.31 D3: Top: E(value) = $30
Bottom: E(value) = $10
Select top at D3 for $30

D1: Top: Value at D1 = 77-50 = $27
Bottom: 90 – 80 = $10
Select top at D1 for $27

D2: Top: E(value) = $66
Middle: E(value) = 0.5(200 – 100) = $50
Bottom: E(value) = $50

18.31 (cont) At D2, value = E(value) – investment

Top: 66 – 25 = $41

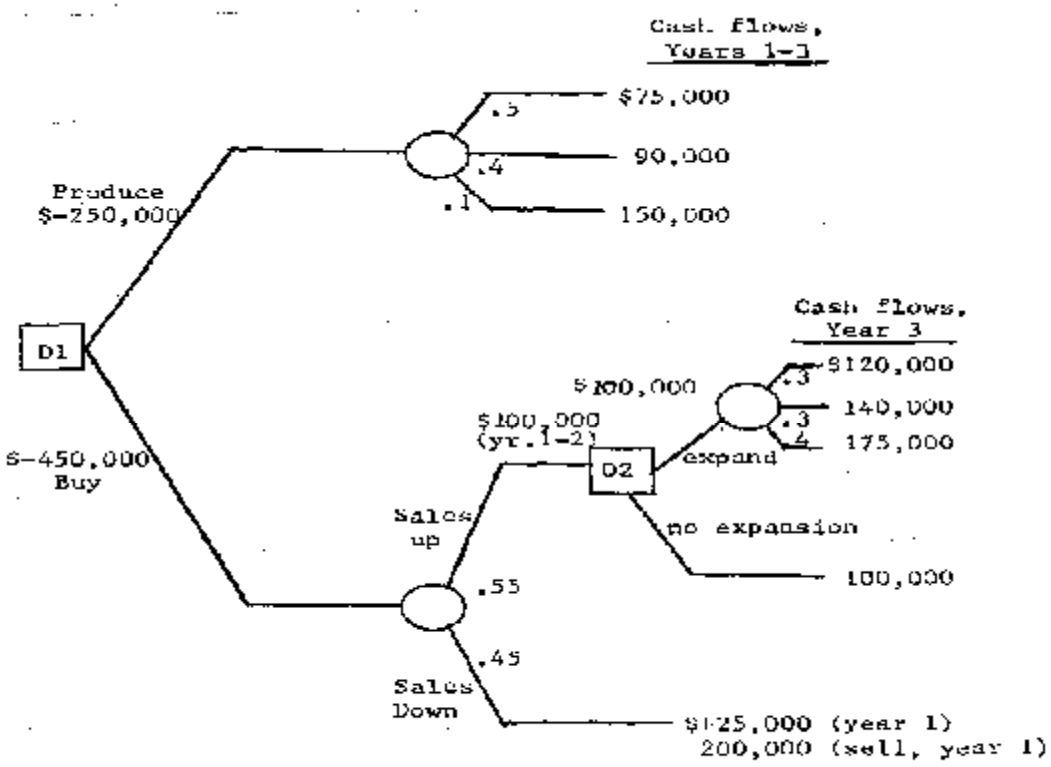
Middle: 50 – 30 = $20

Bottom: 50 – 20 = $30

Select top at D2 for $41

Conclusion: Select D2 path and choose top branch ($25 investment)

18.34 (a) Construct the decision tree.



(b) Expansion option

(PW for D2, $120,000) = $4352

(PW for D2, $140,000) = $21,744

(PW for D2, $175,000) = $52,180

E(PW) = $28,700

18.34 (cont) No expansion option

(PW for D2, $100,000 = $86,960

E(PW) = $86,960

Conclusion at D2: Select no expansion option

(c) Complete foldback to D1.

Produce option, D1

E(PW of cash flows) = $202,063

E(PW for produce) = $–47,937

Buy option, D1

At D2, E(PW) = $86,960

E(PW for buy)= cost + E(PW of sales cash flows)
= –450,000 + 0.55(PW sales up) + 0.45(PW sales down)
= –450,000 + 0.55 (228,320) + 0.45(195,660)
= $–236,377

Conclusion: Both returns are less than 15%, but the expected return is larger for produce option than buy.

(d) The return would increase on the initial investment, but would increase faster for the produce option.