Chapter 16

Depreciation Methods

Solutions to Problems

16.1 Other terms are: recovery rate, realizable value or market value; depreciable life; and personal property

16.2 Book depreciation is used on internal financial records to reflect current capital investment in the asset. Tax depreciation is used to determine the annual tax-deductible amount. They are not necessarily the same amount.

16.3 MACRS has set n values for depreciation by property class. These are commonly different – usually shorter – than the actual, anticipated useful life of an asset.

16.4 Asset depreciation is a deductible amount in computing income taxes for a corporation, so the taxes will be reduced. Thus PW or AW may become positive when the taxes due are lower.

16.5 (a) Quoting Publication 946, 2003 version: "Depreciation is an annual income tax deduction that allows you to recover the cost and other basis of certain property over the time you use the property. It is an allowance for the wear and tear, deterioration, or obsolescence of the property."

(b) "An estimated value of property at the end of its useful life. Not used under MACRS."

(c) General Depreciation System (GDS) and Alternative Depreciation System (ADS). The recovery period and method of depreciation are the primary differences.

(d) The following cannot be MACRS depreciated: intangible property; films and video tapes and recordings; certain property acquired in a nontaxable transfer; and property placed into service before 1987.

16.6 (a) Quoting the glossary under the taxes-businesses section of the website: "A decrease in the value of an asset through age, use, and deterioration. In accounting terminology, depreciation is a deduction or expense claimed for this decrease in value."

(b) "A yearly deduction or depreciation on the cost of certain assets. You can claim CCA for tax purposes on the assets of a business such as buildings or equipment, as well as on additions or improvements, if these assets are expected to last for some years." It is the equivalent of tax depreciation in the USA.

(c) "Real property includes:
- a mobile home or floating home and any leasehold or proprietary interest therein.
- in Quebec, immovable property and every lease thereof; and
- in any other place in Canada, all land, buildings of a permanent nature, and any interest in real property."

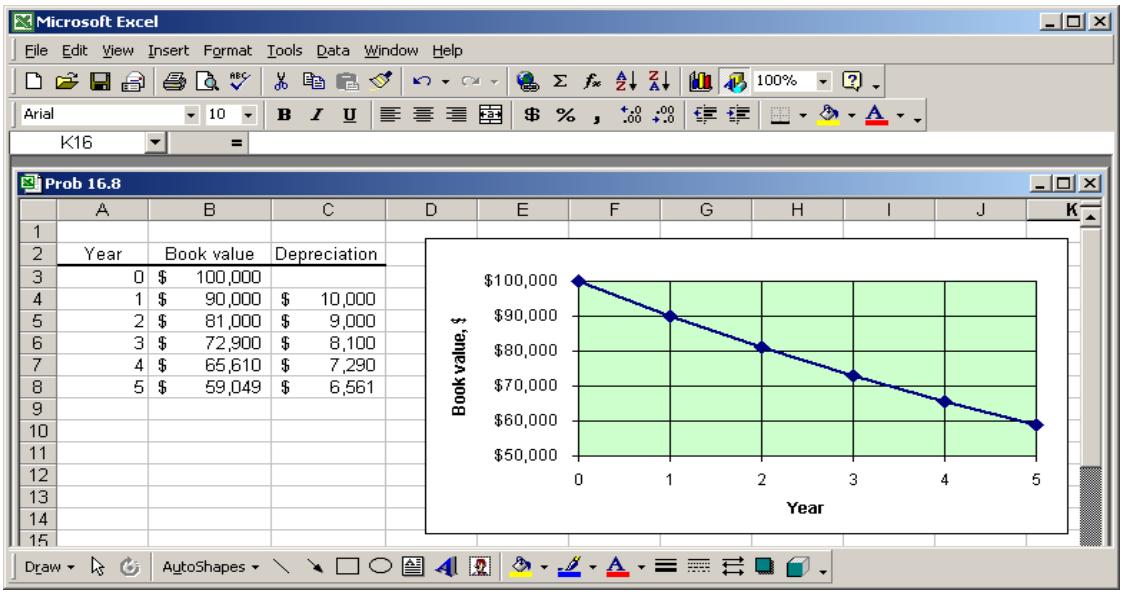
16.7 (a) B = $350,000 + 40,000 = $390,000
n = 7 years
S = 0.1(350,000) = $35,000

(b) Remaining life = 4 years
Market value = $45,000
Book Value = $390,000(1 – 0.65)
= $136,500

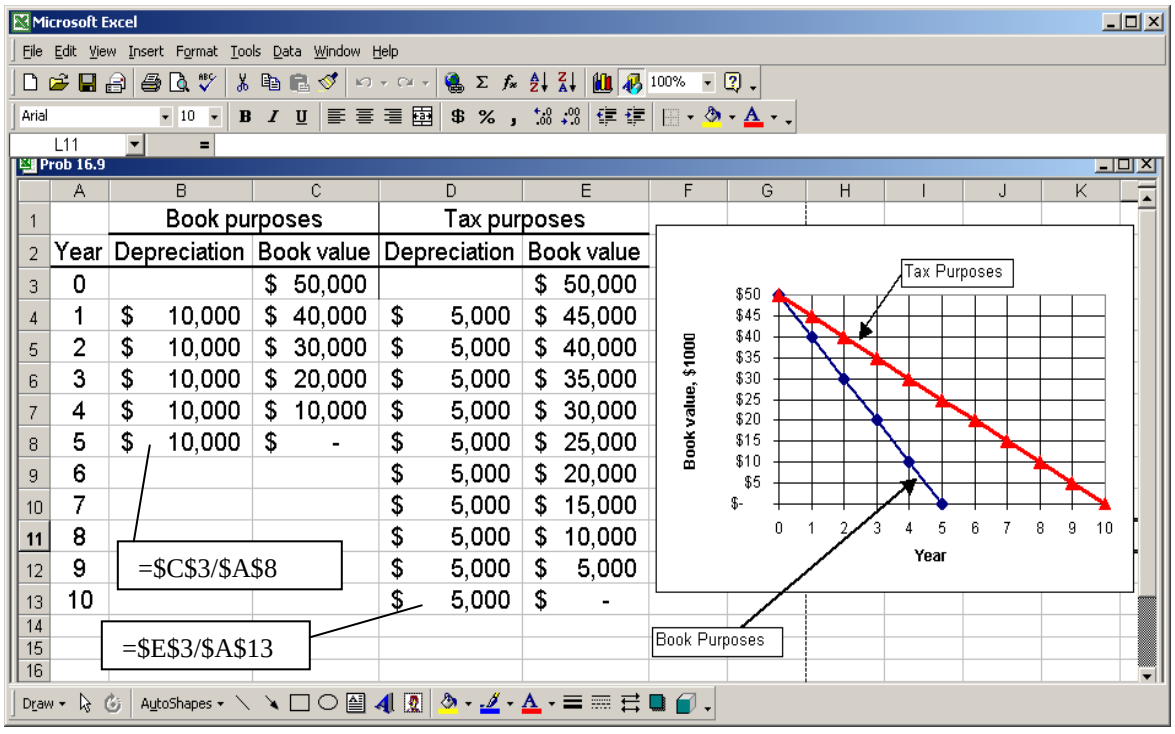
16.8

Year	Book Value	Part (a) Annual Depreciation	Part (b) Depreciation Rate
0	$100,000	0	-----
1	90,000	$10,000	10 %
2	81,000	9000	9
3	72,900	8100	8.1
4	65,610	7290	7.3
5	59,049	6561	6.56

(c) Book value = $59,049 and market value = $24,000.
(d) Plot year versus book value in dollars for the table above



16.9 Write the cell equations to determine depreciation of $10,000 per year for book purpose and $5000 per year for tax purposes and use Excel x-y scatter graph to plot the book values.



16.10 (a) By hand: B = \$400,000 S = 0.1(300,000) = \$30,000

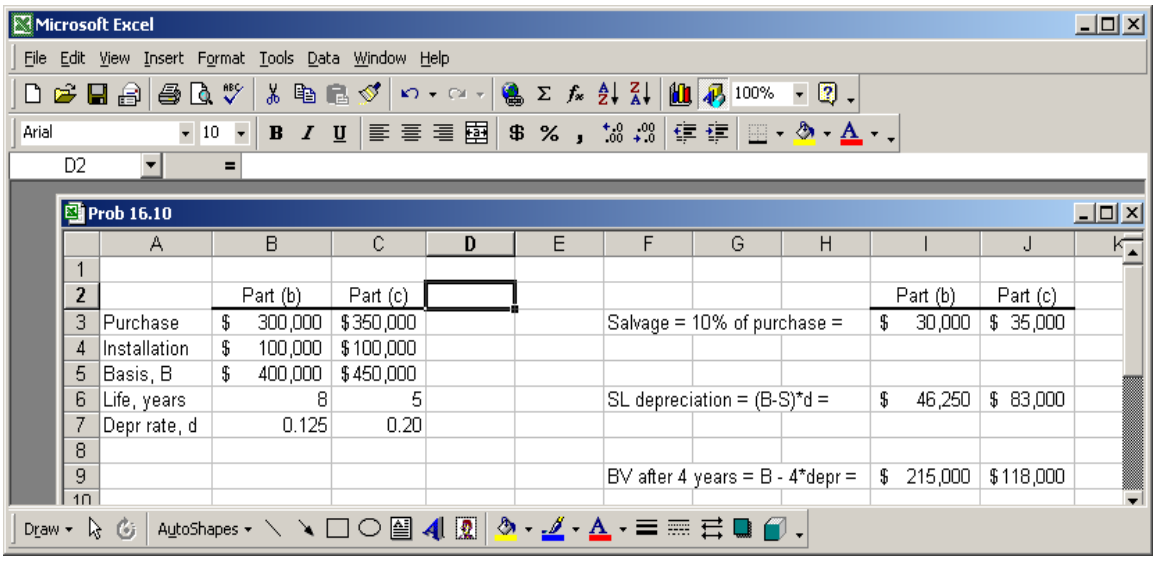
D_t = (400,000-30,000)/8 = \$46,250 per year t (t = 1,…,8)
BV_4 = 400,000 – 4(46,250) = \$215,000

(b) Using Excel: Set up cell equations for depreciation and book value to obtain the same answers as in (a). Spreadsheet shown below.

(c) Change the cell values to B= \$350,000 (C3) and n = 5 (C6). Use the same relations.

S = \$35,000 D_t = \$83,000 BV_4 = \$118,000

One spreadsheet is used here to indicate answers to both parts.



	A	B	C	D	E	F	G	H	I	J
1										
2		Part (b)	Part (c)						Part (b)	Part (c)
3	Purchase	\$ 300,000	\$350,000			Salvage = 10% of purchase =			\$ 30,000	\$ 35,000
4	Installation	\$ 100,000	\$100,000							
5	Basis, B	\$ 400,000	\$450,000							
6	Life, years	8	5			SL depreciation = (B-S)*d =			\$ 46,250	\$ 83,000
7	Depr rate, d	0.125	0.20							
8										
9						BV after 4 years = B - 4*depr =			\$ 215,000	\$118,000
10										

16.11 (a) $D_t = \frac{12{,}000 - 2000}{8} = \$1250$

(b) BV_3 = 12,000 – 3(1250) = \$8250

(c) d =1/n = 1/8 = 0.125

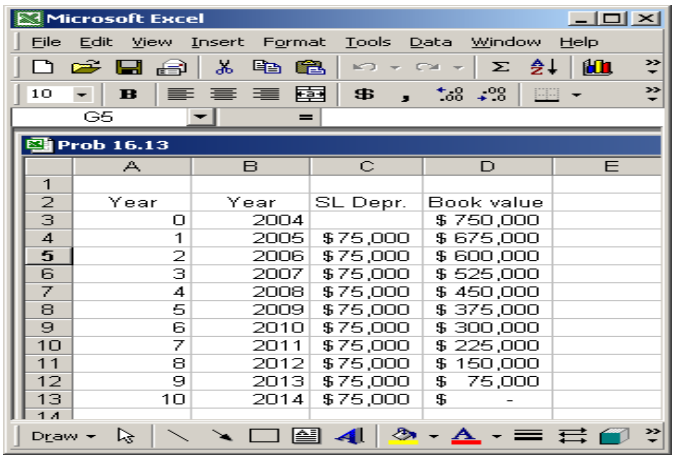
16.12 BV_5 = 200,000 – 5 * SLN(200000,10000,7)
Answer is \$64,285.71

16.13 Use the spreadsheet below.

(a) BV_4 = $450,000

(b) Loss = BV_4 - selling price = 450,000 – 75,000 = $375,000

(c) Two more years when book value is $300,000



	A	B	C	D	E
1					
2	Year	Year	SL Depr.	Book value	
3	0	2004		$ 750,000	
4	1	2005	$75,000	$ 675,000	
5	2	2006	$75,000	$ 600,000	
6	3	2007	$75,000	$ 525,000	
7	4	2008	$75,000	$ 450,000	
8	5	2009	$75,000	$ 375,000	
9	6	2010	$75,000	$ 300,000	
10	7	2011	$75,000	$ 225,000	
11	8	2012	$75,000	$ 150,000	
12	9	2013	$75,000	$ 75,000	
13	10	2014	$75,000	$ -	
14					

16.14 (a) B = $50,000, n = 4, S = 0, d = 0.25

$Year_t$	D_t	Accumulated D_t	BV_t
0	---------	---------	$50,000
1	$12,500	$12,500	37,500
2	12,500	25,000	25,000
3	12,500	37,500	12,500
4	12,500	50,000	0

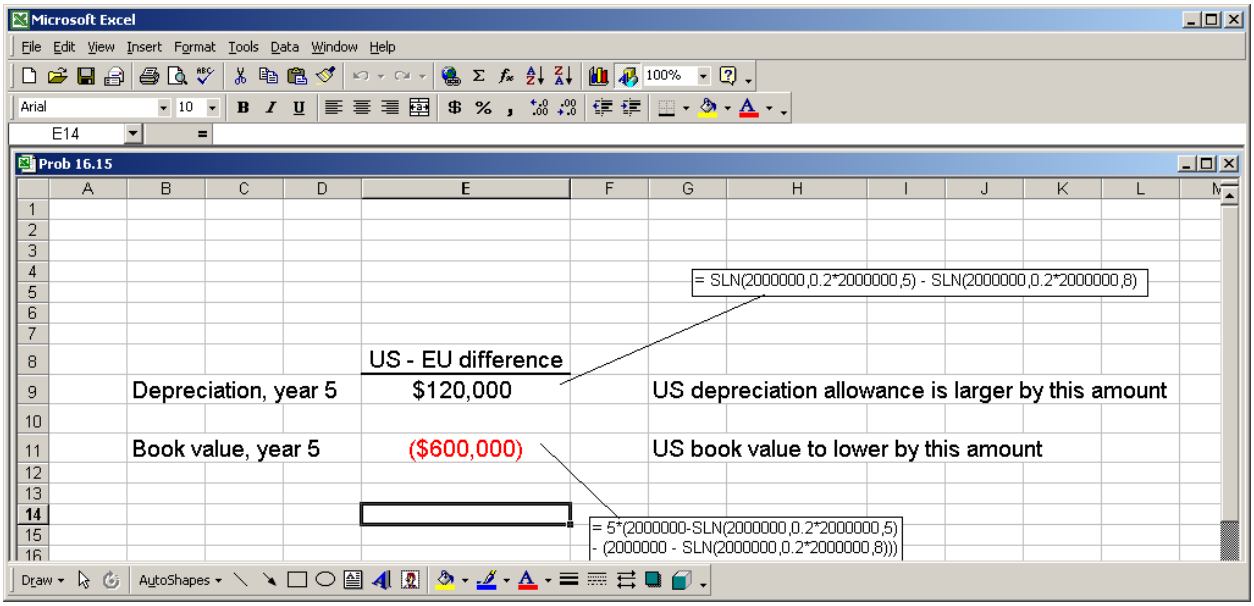
(b) S = $16,000, d = 0.25, B - S = $34,000

Year	D_t	Accumulated D_t	BV_t
0	-------	-------	$50,000
1	$8,500	$8,500	41,500
2	8,500	17,000	33,000
3	8,500	25,500	24,500
4	8,500	34,000	16,000

Plot year versus D_t, accumulated D_t and BV_t on one graph for each salvage value.

(c) Spreadsheets for S = 0 and S = $16,000 provide the same answers as above.

16.15 Use a difference relation (US minus EU) for depreciation and BV in year 5 with the SLN function.



16.16 d is amount of BV removed each year.

d_{max} is maximum legal rate of depreciation for each year; 2/n for DDB.

d_t is actual depreciation rate charged using a particular depreciation model; for DB model it is $d(1-d)^{t-1}$.

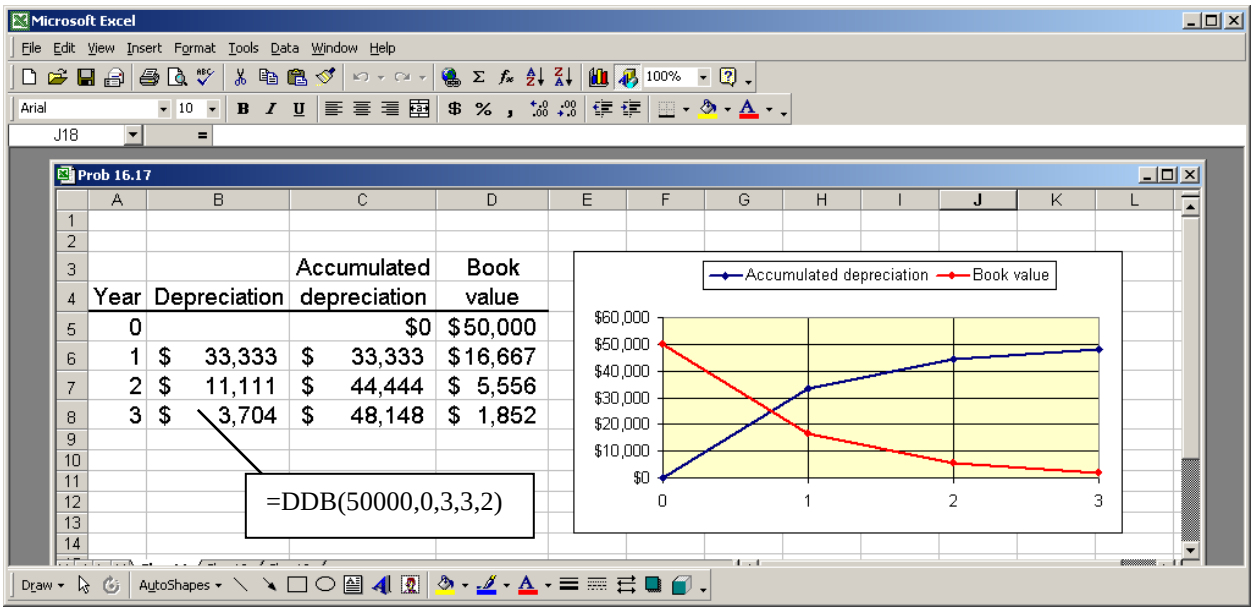
16.17 (a) B = \$50,000, n = 3, d = 2/n = 2/3 = 0.6667 for DDB

Annual depreciation = 0.6667(BV of previous year)

Year	Depreciation, Eq. [16.5]	Accumulated depreciation	Book value
0	-	-	\$50,000
1	\$33,335	\$33,335	16,667
2	11,112	44,447	5,555
3	3,704	48,151	1,851

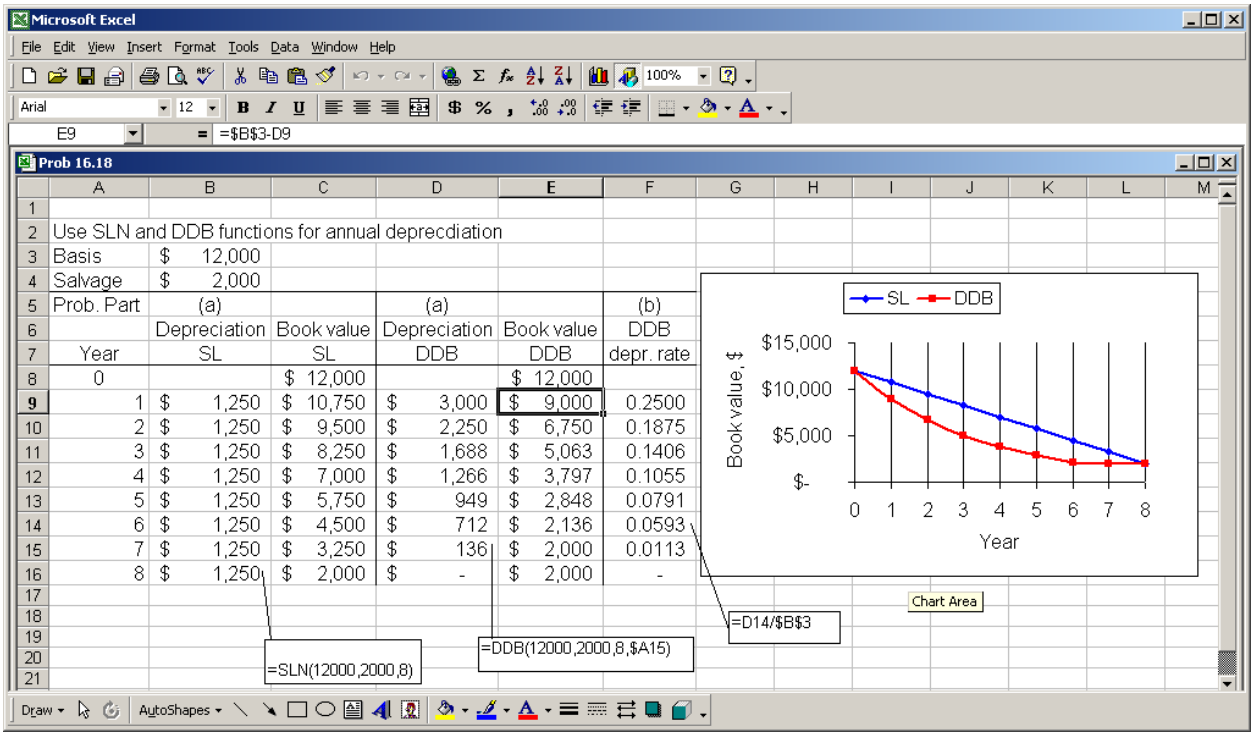
16.17 (cont)

(b) Use the function DDB(50000,0,3,t,2) for annual DDB depreciation in column B. The plot is developed using Excel's xy scatter chart function



Year	Depreciation	Accumulated depreciation	Book value
0		$0	$50,000
1	$ 33,333	$ 33,333	$16,667
2	$ 11,111	$ 44,444	$ 5,556
3	$ 3,704	$ 48,148	$ 1,852

16.18 Set up spreadsheet; use SL and DDB functions; then plot the annual depreciation.



16.19 B = \$800,000; n = 30; S = 0

(a) Straight line depreciation:

$$D_t = \frac{800{,}000}{30} = \$26{,}667 \qquad t = 5,\ 10,\ 25, \text{ and all other years}$$

(b) Double declining balance method: d = 2/n = 2/30 = 0.06667

$$D_5 = 0.06667(800{,}000)(1-0.06667)^{5-1} = \$40{,}472$$
$$D_{10} = 0.06667(800{,}000)(1-0.06667)^{10-1} = \$28{,}664$$
$$D_{25} = 0.06667(800{,}000)(1-0.06667)^{25-1} = \$10{,}183$$

The annual depreciation values are significantly different for SL and DDB.

(c) $D_{30} = 800{,}000(1-0.06667)^{30} = \$100{,}959$

16.20 SL: $d_t = 0.20$ of B = \$25,000
$BV_t = 25{,}000 - t(5{,}000)$

Fixed rate: DB with d = 0.25
$BV_t = 25{,}000(0.75)^t$

DDB: d = 2/5 = 0.40
$BV_t = 25{,}000(0.60)^t$

		Declining balance methods	
Year, t	SL	125% SL	200% SL
d	0.20	0.25	0.40
0	\$25,000	\$25,000	\$25,000
1	20,000	18,750	15,000
2	15,000	14,062	9,000
3	10,000	10,547	5,400
4	5,000	7,910	3,240
5	0	5,933	1,944

16.21 (a) For DDB, use d = 2/18 = 0.11111

$D_2 = 0.11111(182{,}000)(1 - 0.11111)^{2-1} = \$17{,}975$

$D_{18} = 0.11111(182{,}000)(1 - 0.11111)^{18-1} = \$2730$

Compare BV_{17} with S = \$50,000. By Eq. [16.8]

$BV_{17} = 182{,}000(1 - 0.11111)^{17} = \$24{,}575$

It is not okay to use $D_{18} = \$2730$ because the BV has already reached the estimated S of \$50,000.

For DB, calculate d via Eq. [16.11].

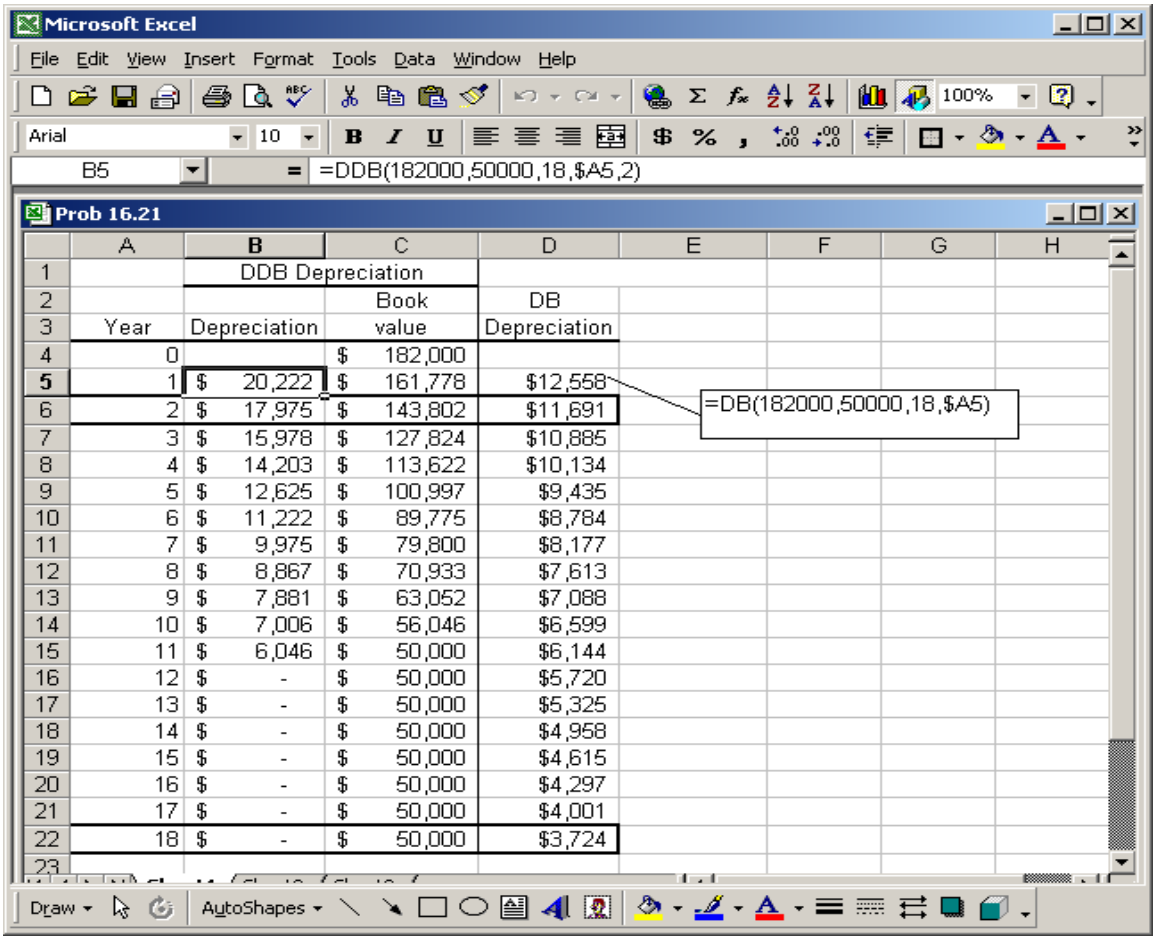
$d = 1 - (50{,}000/182{,}000)^{1/18} = 0.06926$

$D_2 = 0.06926(182{,}000)(0.93074)^1 = \$11{,}732$

$D_{18} = 0.06926(182{,}000)(1 - 0.06926)^{18-1} = \$3721$

(b) For DDB: same values are obtained, with D_{18} = \$0 in cell B22 here.

For DB: DB function uses an implied 3-decimal value of d = 0.069, so the depreciation amounts are slightly different than above: D_2 = \$11,691 (cell D6) and D_{18} = \$3724 by Excel.



	A	B	C	D	E	F	G	H
1		DDB Depreciation						
2			Book	DB				
3	Year	Depreciation	value	Depreciation				
4	0		\$ 182,000					
5	1	\$ 20,222	\$ 161,778	\$12,558				
6	2	\$ 17,975	\$ 143,802	\$11,691				
7	3	\$ 15,978	\$ 127,824	\$10,885				
8	4	\$ 14,203	\$ 113,622	\$10,134				
9	5	\$ 12,625	\$ 100,997	\$9,435				
10	6	\$ 11,222	\$ 89,775	\$8,784				
11	7	\$ 9,975	\$ 79,800	\$8,177				
12	8	\$ 8,867	\$ 70,933	\$7,613				
13	9	\$ 7,881	\$ 63,052	\$7,088				
14	10	\$ 7,006	\$ 56,046	\$6,599				
15	11	\$ 6,046	\$ 50,000	\$6,144				
16	12	\$ -	\$ 50,000	\$5,720				
17	13	\$ -	\$ 50,000	\$5,325				
18	14	\$ -	\$ 50,000	\$4,958				
19	15	\$ -	\$ 50,000	\$4,615				
20	16	\$ -	\$ 50,000	\$4,297				
21	17	\$ -	\$ 50,000	\$4,001				
22	18	\$ -	\$ 50,000	\$3,724				
23								

16.22 The implied d is 0.06926. The factor for the DDB function is

factor = implied DB rate / SL rate

= 0.06926 / (1/18)

= 1.24668

The DDB function is DDB(182000,50000,18,18,1.24668)

$D_{18} = 0.06926(182{,}000)(0.93074)^{17} = \$3721$

The D_{18} value must be acceptable since d was calculated using estimated values.

16.23 (a) $d = 1.5/12 = 0.125$

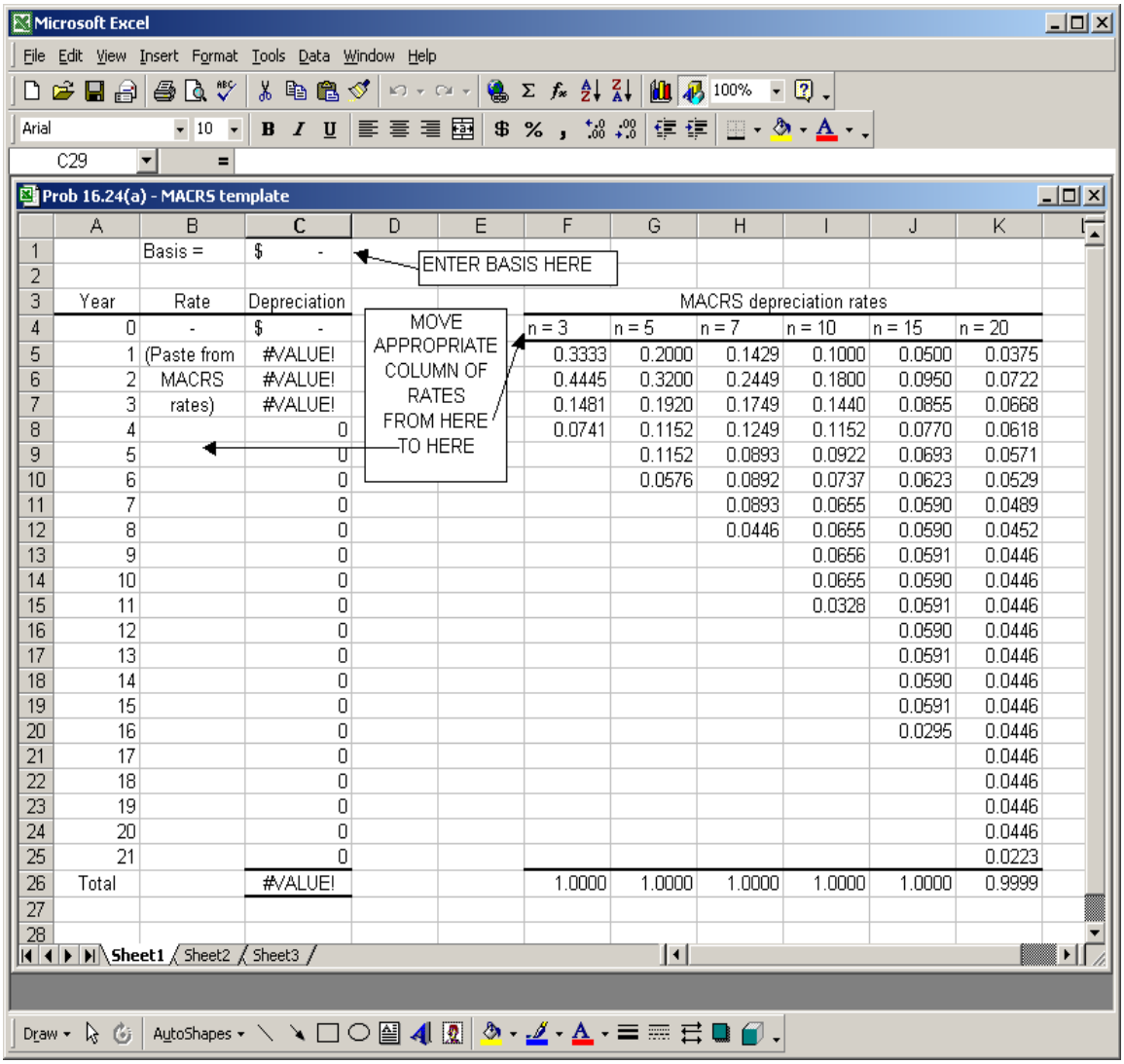
$D_1 = 0.125(175{,}000)(0.875)^{1-1} = \$21{,}875$
$BV_1 = 175{,}000(0.875)^1 = \$153{,}125$

$D_{12} = 0.125(175{,}000)(0.875)^{12-1} = \$5{,}035$
$BV_{12} = 175{,}000(0.875)^{12} = \$35{,}248$

(b) The 150% DB salvage value of $35,248 is larger than S = $32,000.

(c) = DDB(175000,32000,12,t,1.5) for t = 1, 2, …, 12

16.24 One version of a MACRS depreciation template is shown. Cut and paste the appropriate rate series into column B, enter the basis in cell C1 and the results are presented.



16.25 Personal property: manufacturing equipment, construction equipment, company car
Real property: warehouse building; rental house (not land of any kind)

16.26 B = $500,000 S = $100,000 n = 10 years

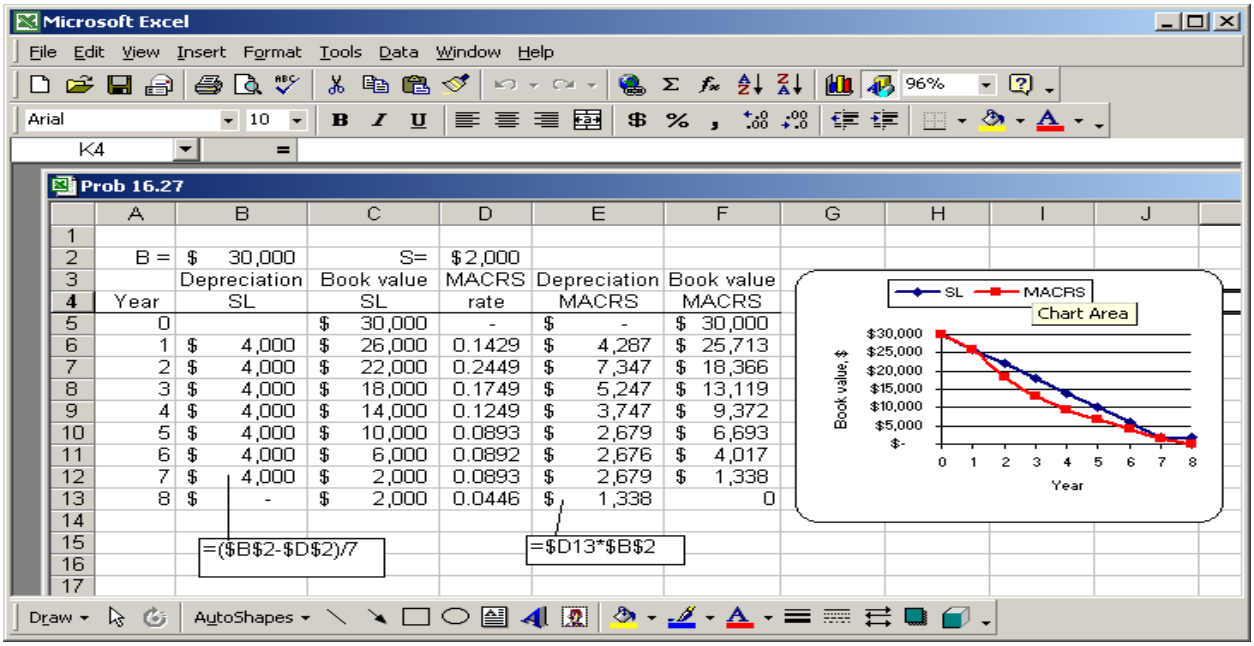
SL:	d = 1/n = 1/10	D_1 = (B-S)/n = (500,000 – 100,000)/10 = $40,000
DDB:	d = 2/10 = 0.20	D_1 = dB = 0.20(500,000) = $100,000
150% DB:	d = 1.5/10 = 0.15	D_1 = dB = 0.15(500,000) = $75,000
MACRS:	d = 0.1	D_1 = 0.1(500,000) = $50,000

The first-year tax depreciation amounts vary considerably from $40,000 to $100,000.

16.27 (a) SL Depreciation each year = (30,000 – 2000)/7 = $4000

	Straight line method		MACRS method		
Year	Depr	Book value	d rate	Depr	Book value
0	-	$30,000	-	-	$30,000
1	$4,000	26,000	0.1429	$4,287	25,713
2	4,000	22,000	0.2449	7,347	18,366
3	4,000	18,000	0.1749	5,247	13,119
4	4,000	14,000	0.1249	3,747	9,372
5	4,000	10,000	0.0893	2,679	6,693
6	4,000	6,000	0.0892	2,676	4,017
7	4,000	2,000	0.0893	2,679	1,338
8	0	2,000	0.0446	1,338	0

(b) Calculate the BV values and plot using the xy scatter chart.



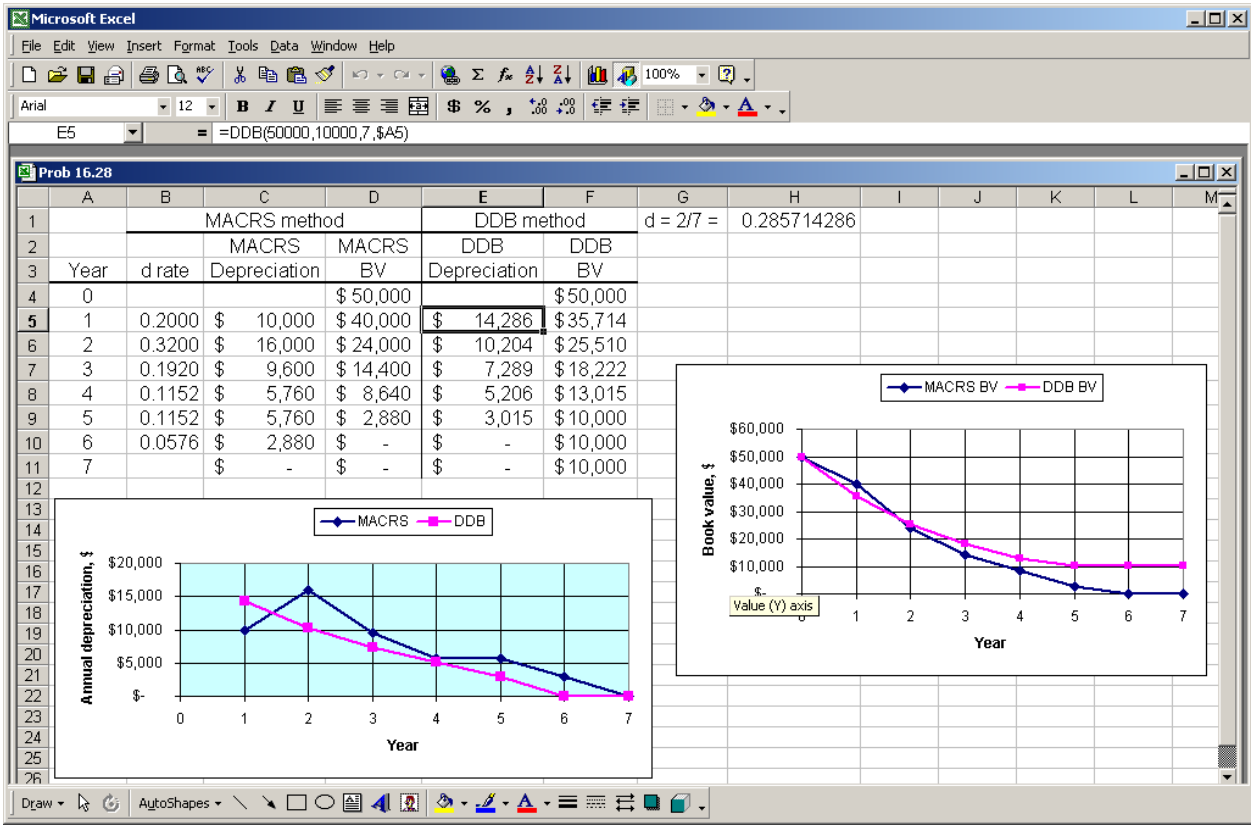
16.28 (a) and (b) For MACRS use Table 16.2 rates for n = 5. For DDB, with d = 0.2857, stop depreciating at S = $10,000.

	(a) MACRS			(b) DDB	
Year	d rate	Depr	BV	Depr	BV
0	-	-	$50,000	-	$50,000
1	0.20	$10,000	40,000	$14,285	35,715
2	0.32	16,000	24,000	10,204	25,511
3	0.192	9,600	14,400	7,288	18,222
4	0.1152	5,760	8,640	5,206	13,016
5	0.1152	5,760	2,880	3,016*	10,000
6	0.0576	2,880	0	-	10,000
7	-		0	-	10,000

*D_5 = 0.2857(13,016) = $3,719 is too large since BV < $10,000

MACRS depreciates to BV = 0 while DDB stops at S = $10,000.

(c) Plot the depreciation and BV columns on x–y scatter charts.



	A	B	C	D	E	F	G	H
1		MACRS method			DDB method		d = 2/7 =	0.285714286
2			MACRS	MACRS	DDB	DDB		
3	Year	d rate	Depreciation	BV	Depreciation	BV		
4	0			$ 50,000		$ 50,000		
5	1	0.2000	$ 10,000	$ 40,000	$ 14,286	$ 35,714		
6	2	0.3200	$ 16,000	$ 24,000	$ 10,204	$ 25,510		
7	3	0.1920	$ 9,600	$ 14,400	$ 7,289	$ 18,222		
8	4	0.1152	$ 5,760	$ 8,640	$ 5,206	$ 13,015		
9	5	0.1152	$ 5,760	$ 2,880	$ 3,015	$ 10,000		
10	6	0.0576	$ 2,880	$ -	$ -	$ 10,000		
11	7		$ -	$ -	$ -	$ 10,000		

16.29 For classical SL, n = 5 and
$D_t = 450{,}000/5 = \$90{,}000$
$BV_3 = 450{,}000 - 3(90{,}000) = \$180{,}000$

For MACRS, after 3 years for n = 5 sum the rates in Table 16.2.
$\Sigma D_t = 450{,}000(0.712) = \$320{,}400$
$BV_3 = \$450{,}000\text{-}320{,}400 = \$129{,}600$
The difference is $50,400, which has not been removed by classical SL depreciation.

16.30 Use n = 39 with d = 1/39 = 0.02564 in all 38 years except years 1 and 40 as specified by MACRS.

Year	d rate	Depreciation
1	0.01391	$25,038
2-39	0.02564	46,152
40	0.01177	21,186

16.31 (a) For MACRS, use n = 5 and the Table 16.2 rates with B = $100,000.
For SL, use n = 10 with d = 0.05 in years 1 and 11 and d = 0.1 in all others

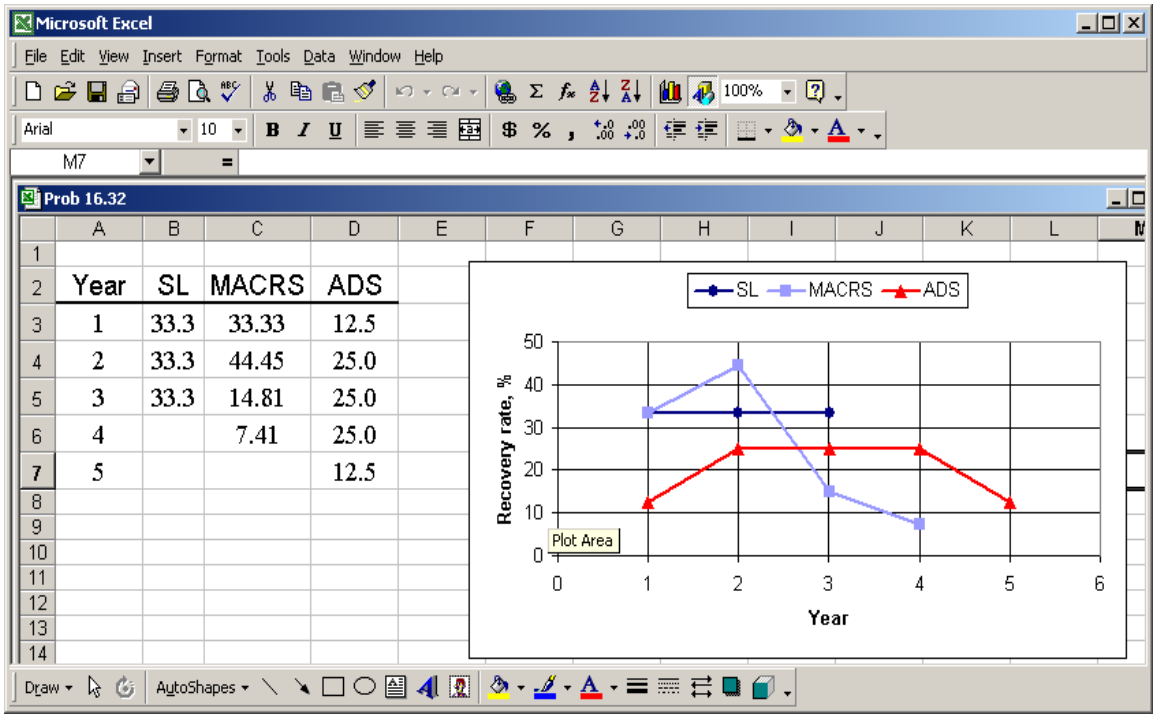
	MACRS			SL		
Year	d	Depr	BV	d	Depr	BV
0	-	-	$100,000	-	-	$100,000
1	0.2000	$20,000	80,000	0.05	$ 5,000	95,000
2	0.3200	32,000	48,000	0.10	10,000	85,000
3	0.1920	19,200	28,800	0.10	10,000	75,000
4	0.1152	11,520	17,280	0.10	10,000	65,000
5	0.1152	11,520	5760	0.10	10,000	55,000
6	0.0576	5760	0	0.10	10,000	45,000
7	--------	------	0	0.10	10,000	35,000
8	--------	------	0	0.10	10,000	25,000
9	--------	------	0	0.10	10,000	15,000
10	--------	------	0	0.10	10,000	5000
11	--------	------	0	0.05	5000	0

Plot the two BV columns on one graph manually and by Excel chart.

(b) MACRS: sum d values for 3 years: 0.20 + 0.32 + 0.192 = 0.712 (71.2%)
SL: sum the d values for 3 years: 0.05 + 0.1 + 0.1 = 0.25 (25%)
SL depreciates much slower early in the recovery period.

16.32 ADS recovery rates are d = ¼ = 0.25 except for years 1 and 5, which are 50% of this.

	d values (%)		
Year	SL	MACRS	ADS MACRS
1	33.3	33.33	12.5
2	33.3	44.45	25.0
3	33.3	14.81	25.0
4	0	7.41	25.0
5			12.5



16.33 There is a larger depreciation allowance that is tax deductible, so more revenue is retained as net profit after taxes.

16.34 (a) Use Equation [16.15] for cost depletion factor.

p_t = 1,100,000/350,000 = \$3.143 per ounce

Cost depletion, 3 years = 3.143(175,000) = \$550,025

(b) Remaining investment = 1,100,000 – 550,025 = $549,975

New p_t = 549,975/100,000 = $5.50 per ounce

(c) Cost depletion: $Depl = 35,000(5.50) = $192,500

Percentage depletion: %Depl = 15% of gross income
= 0.15(35,000)(5.50) = $28,875

From Equation [16.17], %Depl < $Depl; depletion for the year is

$Depl = $192,500

16.35 Percentage depletion for copper is 15% of gross income, not to exceed 50% of taxable income.

Year	Gross* income	% Depl @ 15%	50% of TI	Allowed depletion
1	$3,200,000	$480,000	$750,000	$480,000
2	7,020,000	1,053,000	1,000,000	1,000,000
3	2,990,000	448,500	500,000	448,500

*GI = (tons)($/pound)(2000 pounds/ton)

16.36 (a) p_t = $3.2/2.5 million = $1.28 per ton
Percentage depletion is 5% of gross income each year

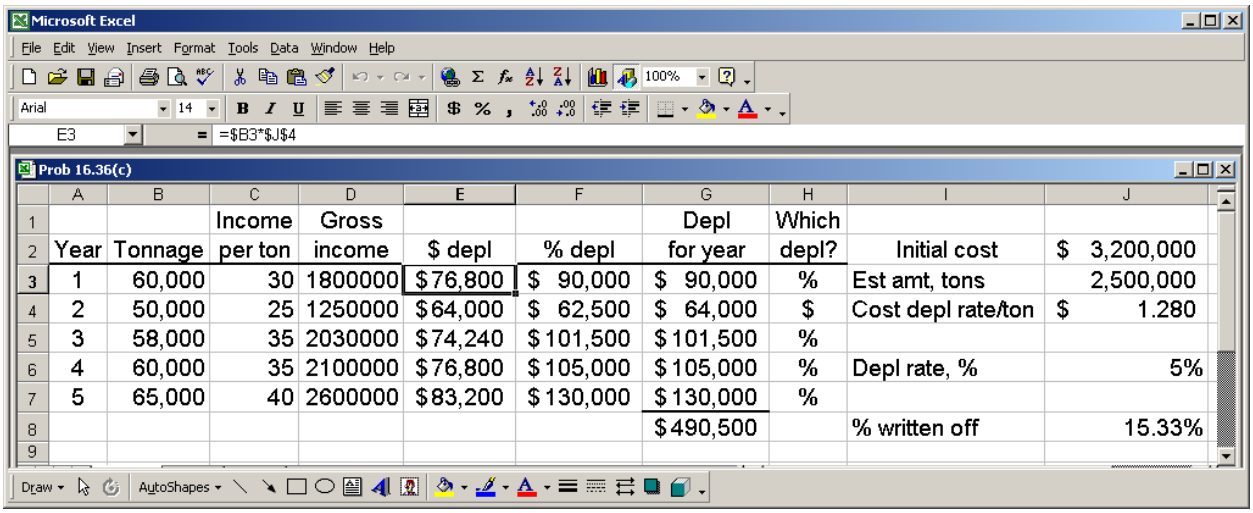
Year	Tonnage for cost depletion	Per-ton gross income	Gross income for percentage depletion
1	60,000	$30	$ 1,800,000
2	50,000	25	1,250,000
3	58,000	35	2,030,000
4	60,000	35	2,100,000
5	65,000	40	2,600,000

16.36 (cont)

Year	$Depl, $1.28 x tonnage per year	%Depl, 5% of GI	Selected
1	$76,800	$90,000	%Depl
2	64,000	62,500	$Depl
3	74,240	101,500	%Depl
4	76,800	105,000	%Depl
5	83,200	130,000	%Depl

(b) Total depletion is $490,500
% written off = 490,500/3.2 million = 15.33%

(c) Set up the spreadsheet with all needed data.



	A	B	C	D	E	F	G	H	I	J
1			Income	Gross			Depl	Which		
2	Year	Tonnage	per ton	income	$ depl	% depl	for year	depl?	Initial cost	$ 3,200,000
3	1	60,000	30	1800000	$76,800	$ 90,000	$ 90,000	%	Est amt, tons	2,500,000
4	2	50,000	25	1250000	$64,000	$ 62,500	$ 64,000	$	Cost depl rate/ton	$ 1.280
5	3	58,000	35	2030000	$74,240	$101,500	$101,500	%		
6	4	60,000	35	2100000	$76,800	$105,000	$105,000	%	Depl rate, %	5%
7	5	65,000	40	2600000	$83,200	$130,000	$130,000	%		
8							$490,500		% written off	15.33%
9										

(d) The undepleted investment after 3 years:
3.2 million – (90,000 + 64,000 + 101,500) = $2,944,500

New cost depletion factor is:

p_t = $2.9445 million/1.5 million tons
= $1.963 per ton

Cost depletion for years 4 and 5:
year 4: 60,000(1.963) = $117,780 (> %Depl)

year 5: 65,000(1.983) = $127,595 (< %Depl)

Percentage depletion amounts are the same.

Conclusion: Select $Depl for year 4 and %Depl in year 5.
% written off = $503,280/3.2 million = 15.73%

FE Review Solutions

16.37 $D = \frac{20{,}000 - 2000}{5} = \$3600$ per year

Answer is (a)

16.38 From table, depreciation factor is 17.49%.

D = 35,000(0.1749) = $6122

Answer is (d)

16.39 $D = \frac{50{,}000 - 10{,}000}{5} = \$8000$ per year

$BV_3 = 50{,}000 - 3(8{,}000) = \$26{,}000$

Answer is (b)

16.40 The MACRS depreciation rates are 0.2 and 0.32.

$D_1 = 50{,}000(0.20) = \$10{,}000$

$D_2 = 50{,}000(0.32) = \$16{,}000$

$BV_2 = 50{,}000 - 10{,}000 - 16{,}000 = \$24{,}000$

Answer is (c)

16.41 By the straight line method, book value at end of asset's life MUST equal salvage value ($10,000 in this case).

Answer is (c)

16.42 Total depreciation = first cost – BV after 3 years
= 50,000 – 21,850 = $28,150

Answer is (d)

16.43 Straight line rate is always used as the reference.

Answer is (a)

Chapter 16 Appendix

Solutions to Problems

16A.1 The depreciation rate is from Eq. [16A.4] using SUM = 36.

t	d_t	D_t, euro	BV_t, euro
1	8/36	2,222.22	9777.78
2	7/36	1,944.44	7833.33
3	6/36	1,666.67	6166.67
4	5/36	1,388.89	4777.78
5	4/36	1,111.11	3666.67
6	3/36	833.33	2833.33
7	2/36	555.56	2277.78
8	1/36	277.78	2000.00

$$BV_1 = 12{,}000 - \left[\frac{1(8 - 0.5 + 0.5)}{36} \right] (12{,}000 - 2000) = 9777.78 \text{ euro}$$

$$BV_2 = 12{,}000 - \left[\frac{2(8 - 1 + 0.5)}{36} \right] (10{,}000) = 7833.33 \text{ euro}$$

16A.2 (a) Use B = \$150,000; n = 10; S = \$15,000 and SUM = 55.

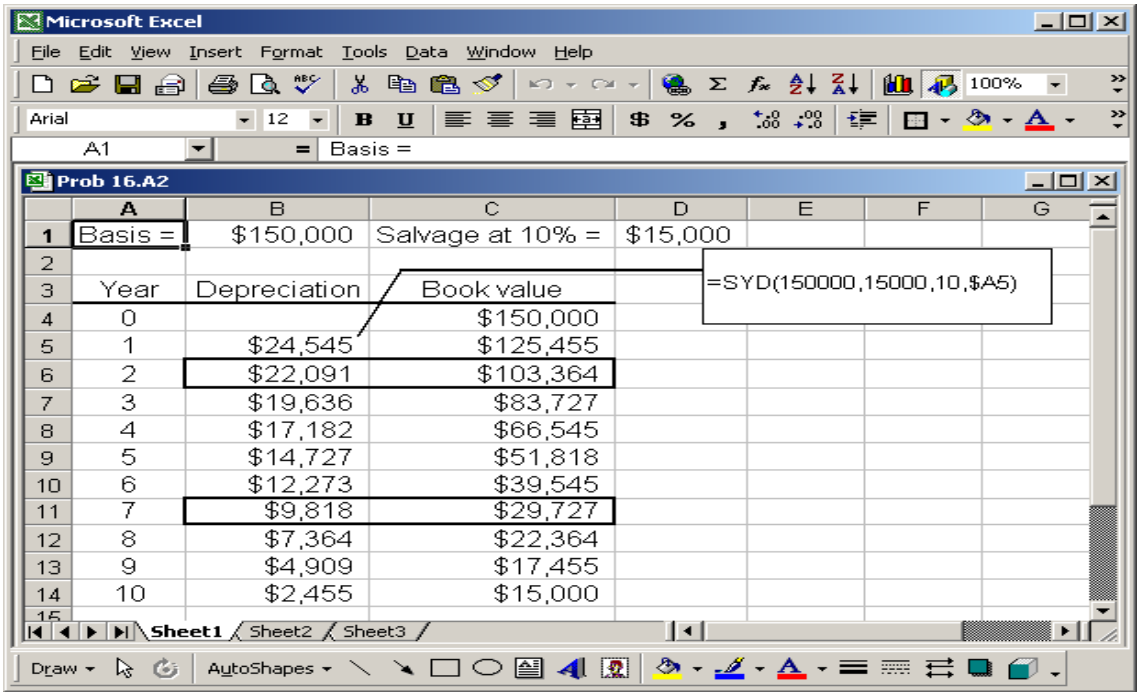
$$D_2 = \frac{10 - 2 + 1}{55} (150{,}000 - 15{,}000) = \$22{,}091$$

$$BV_2 = 150{,}000 - \left[\frac{2(10 - 1 + 0.5)}{55} \right] (150{,}000 - 15{,}000) = \$103{,}364$$

$$D_7 = \frac{10 - 7 + 1}{55} (150{,}000 - 15{,}000) = \$9818$$

$$BV_7 = 150{,}000 - \left[\frac{7(10 - 3.5 + 0.5)}{55} \right] (150{,}000 - 15{,}000) = \$29{,}727$$

(b)



	A	B	C	D	E	F	G
1	Basis =	$150,000	Salvage at 10% =	$15,000			
2							
3	Year	Depreciation	Book value				
4	0		$150,000				
5	1	$24,545	$125,455				
6	2	$22,091	$103,364				
7	3	$19,636	$83,727				
8	4	$17,182	$66,545				
9	5	$14,727	$51,818				
10	6	$12,273	$39,545				
11	7	$9,818	$29,727				
12	8	$7,364	$22,364				
13	9	$4,909	$17,455				
14	10	$2,455	$15,000				

16A.3 B = \$12,000; n = 6 and S = 0.15(12,000) = \$1,800

(a) Use Equation. [16A.3] and S = 21.

$$BV_3 = 12{,}000 - \left[\frac{3(6 - 1.5 + 0.5)}{21}\right](12{,}000 - 1800) = \$4714$$

(b) By Eq. [16A.4] and t = 4:

$$d_4 = \frac{6 - 4 + 1}{21} = 3/21 = 1/7$$

$$D_4 = d_4(B - S)$$
$$= (3/21)(12{,}000 - 1800)$$
$$= \$1457$$

16A.4 B = $45,000 n = 5 S = $3000 i = 18%

Compute the D_t for each method and select the larger value to maximize PW_D.

For DDB, d = 2/5 = 0.4. By Equation [16A.6], $BV_5 = 45{,}000(1 - 0.4)^5 = 3499 > 3000$

Switching is advisable. Remember to consider S = $3000 in Equation [16A.8].

	DDB Method		Switching to SL method	Larger
t	Eq. [16A.7]	BV	Eq. [16A.8]	Depr
0	-	$45,000	-	-
1	$18,000	27,000	$8,400	$18,000 (DDB)
2	10,800	16,200	6,000	10,800 (DDB)
3	6,480	9,720	4,400	6,480 (DDB)
4	3,888	5,832	3,360	3,888 (DDB)
5	2,333	3,499*	2,832	2,832 (SL)

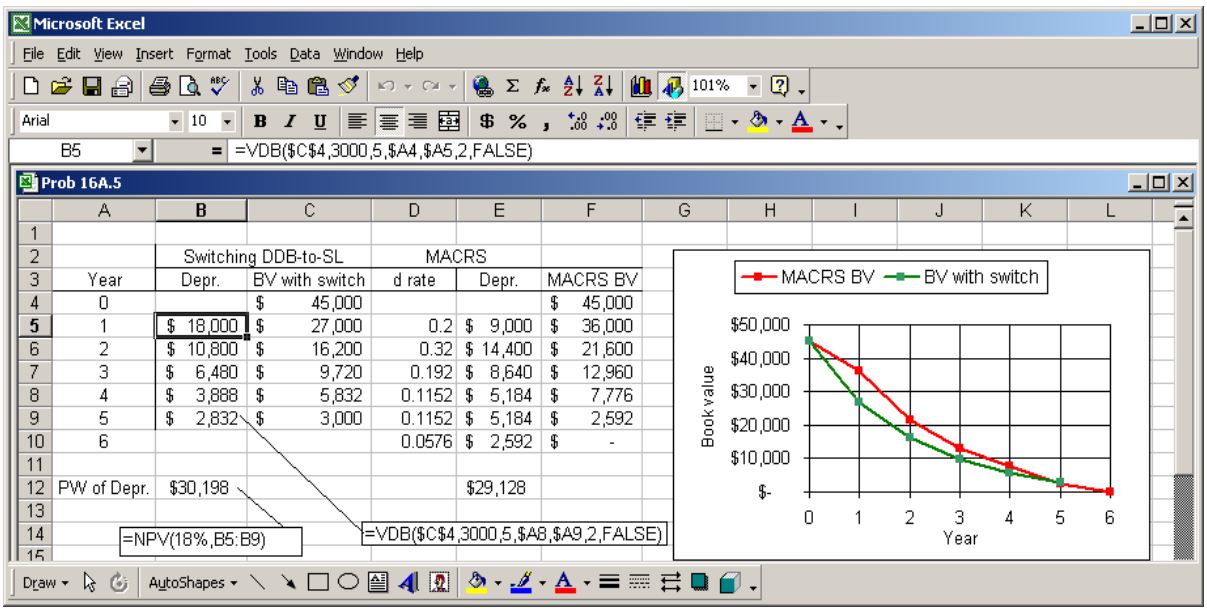
*BV_5 will be $3000 exactly when SL depreciation of $2832 is applied in year 5.

$$BV_5 = 5832 - 2832 = \$3000$$

The switch to SL occurs in year 5 and the PW of depreciation is:

$$PW_D = 18{,}000(P/F,18\%,1) + \ldots + 2{,}832(P/F,18\%,5)$$
$$= \$30{,}198$$

16A.5 Develop a spreadsheet for the DDB-to-SL switch using the VDB function (column B) and MACRS values plus the PW_D for both methods.



Were switching allowed in the USA, it would give only a slightly higher PW_D = \$30,198 compared to the value for MACRS of PW_D = \$29,128.

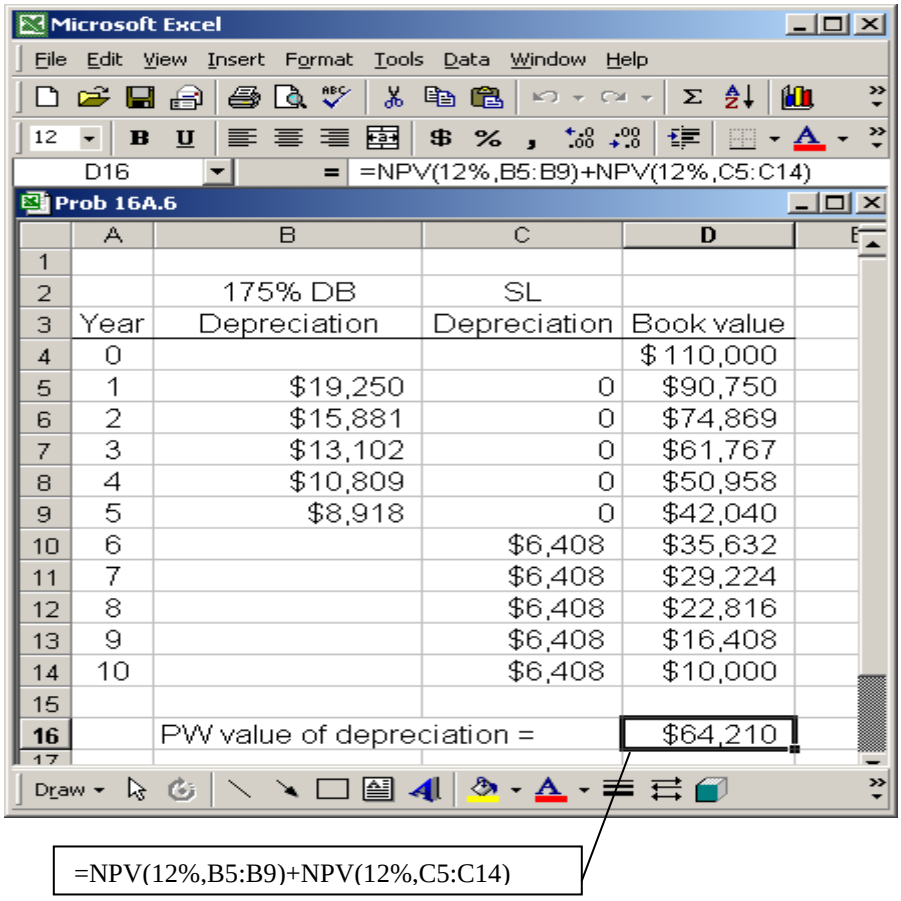
16A.6 175% DB: $d = \frac{1.75}{10} = 0.175$ for t = 1 to 5

$BV_t = 110{,}000(0.825)^t$

SL: $D_t = \frac{BV_5 - 10{,}000}{5} = (42{,}040 - 10{,}000)/5 = \$6408$ for t = 6 to 10

$BV = BV_5 - t(6408)$

PW_D = \$64,210 from Column D using the NPV function.



16A.7 (a) Use Equation [16A.6] for DDB with d = 2/25 = 0.08.

$BV_{25} = 155{,}000(1 - 0.08)^{25} = \$19{,}276.46 < \$50{,}000$
No, the switch should not be made.

(b) $155{,}000(1\text{-}d)^{25} > 50{,}000$

$$1 - d > [\,50{,}000/155{,}000]^{1/25}$$

$$1 - d > (0.3226)^{0.04} = 0.95575$$
$$d < 1 - 0.95575 = 0.04425$$

If d < 0.04425 the switch is advantageous. This is approximately 50% of the current DDB rate of 0.08. The SL rate would be d = 1/25 = 0.04.

16A.8 Verify that the rates are the following with d = 0.40:

t	1	2	3	4	5	6
d_t	0.20	0.32	0.192	0.1152	0.1152	0.0576

d_1: $d_{DB,\,1} = 0.5d = 0.20$

d_2: By Eq. [16A.14] for DDB:

$d_{DB,\,2} = 0.4(1 - 0.2) = 0.32$ (Selected)

By Eq. [16A.15] for SL:

$d_{SL,\,2} = 0.8/4.5 = 0.178$

d_3: For DDB

$d_{DB,\,3} = 0.4(1 - 0.2 - 0.32)$
$= 0.192$ (Selected)

For SL
$d_{SL,\,2} = 0.48/3.5 = 0.137$

d_4: $d_{DB,\,4} = 0.4(1 - 0.2 - 0.32 - 0.192)$
$= 0.1152$
$d_{SL,\,4} = 0.288/2.5 = 0.1152$ (Select either)

Switch to SL occurs in year 4.

d_5: Use the SL rate n = 5.
$d_{SL,\,5} = 0.1728/1.5 = 0.1152$

d_6: $d_{SL,\,6}$ is the remainder or 1/2 the d_5 rate.

$$d_{SL,\,6} = 1 - \sum_{t=1}^{5} d_t = 1 - (0.2 + 0.32 + 0.192 + 0.1152 + 0.1152)$$

$=0.0576$

16A.9 B = \$30,000 n = 5 years d = 0.40

Find BV_3 using d_t rates derived from Equations [16A.10] through [16A.12].

t = 1: $d_1 = 1/2(0.4) = 0.2$
$D_1 = 30{,}000(0.2) = \$6000$
$BV_1 = \$24{,}000$

t = 2: For DDB depreciation, use Eq. [16A.11]
d = 0.4
$D_{DB} = 0.4(24{,}000)$
$= \$9600$

$BV_2 = 24{,}000 - 9600 = \$14{,}400$

For SL, if switch is better, in year 2, by Eq. [16A.12].

$$D_{SL} = \frac{24{,}000}{5-2+1.5} = \$5333$$

Select DDB; it is larger.

t = 3: For DDB, apply Eq. [16A.11] again.

$D_{DB} = 14{,}400(0.4) = \$5760$
$BV_3 = 14{,}400 - 5760 = \$8640$

For SL, Eq. [16A.12]

$$D_S = \frac{14{,}400}{5-3+1.5} = \$4114$$

Select DDB.

Conclusion: When sold for \$5000, $BV_3 = \$8640$. Therefore, there is a loss of \$3640 relative to the MACRS book value.

NOTE: If Table 16.2 rates are used, cumulative depreciation in % for 3 years is:

20 + 32 + 19.2 = 71.2%
30,000(0.712) = $21,360
BV_3 = 30,000 – 21,360 = $8640

16A.10 Determine MACRS depreciation for n = 7 using Equations [16A.10] through [16A.12]. and apply them to B = $50,000. (S) indicates the selected method and amount.

	DDB		SL	
t = 1:	d = 1/7 = 0.143		D_{SL} = 0.5(1/7)(50,000)	
	D_{DB} = $7150	(S)	= $3571	
	BV_1 = $42,850			
t = 2:	d = 2/7 = 0.286		D_{SL} = 42,850 / 7–2+1.5 = $6592	
	D_{DB} = $12,255	(S)		
	BV_2 = $30,595			
t = 3:	d = 0.286		D_{SL} = 30,595 / 7–3+1.5 = $5563	
	D_{DB} = $8750	(S)		
	BV_3 = $21,845			
t = 4:	d = 0.286		D_{SL} = 21,845 / 7–4+1.5 = $4854	
	D_{DB} =$6248	(S)		
	BV_4 =15,597			
t = 5:	d = 0.286		D_{SL} = 15,597 / 7–5+1.5 = $4456	
	D_{DB} = $4461	(S)		
	BV_5 = $11,136			
t = 6:	d = 0.286		D_{SL} = 11,136 / 7–6+1.5 = $4454	(S)
	D_{DB} = $3185		BV_6 = $6682	
	(Use SL hereafter)			
t = 7:			D_{SL} = 6682 / 7–7+1.5 = $4454	
			BV_7 = $2228	
t = 8:			D_{SL} = $2228	
			BV_8 = 0	

The depreciation amounts sum to $50,000.

Year	Depr	Year	Depr
1	$ 7150	5	$4461
2	12,255	6	4454
3	8750	7	4454
4	6248	8	2228

16A.11 (a) The SL rates with the half-year convention for n = 3 are:

Year	d rate	Formula
1	0.167	1/2n
2	0.333	1/n
3	0.333	1/n
4	0.167	1/2n

(b)

t	1	2	3	4	PW_D
MACRS	$26,664	35,560	11,848	5928	$61,253
SL Alternative	$13,360	26,640	26,640	13,360	$56,915

The MACRS PW_D is larger by $4338.