Chapter 9 Depreciation and Corporate Taxes

Economic Depreciation

Note: For most up-to-date depreciation and income tax information, consult the book's website at http://www.prenhall.com and click on "Tax Information"

9.1 The loss of value is defined as the purchase price of an asset less its market value, also known as economic depreciation. Economic depreciation = $20,000 - $7,000 = $\boxed{\$13,000}$

Cost Basis

9.2

- Total property value with the house:

Description	Land	House
Original cost	$65,000	$135,000
Add: New house		$250,000
Demolition expenses		$5,000
Adjusted cost basis	$65,000	$390,000

Total value = $65,000 + $390,000 = $455,000

Note that the demolished old house has no value. This loss may be deductible for tax purpose, but this should not be added to the cost basis of the new asset. In general, the property's entire basis is allocated to the land only, if the company intends to demolish the building when they acquire property for business use. Then, the cost basis is increased by the net cost of demolition. (The demolition expense can be treated as a site preparation expense.)

- Cost basis for depreciation = $5,000 + $250,000 = $255,000

9.3 Cost basis for flexible manufacturing cells:

Flexible manufacturing cells ($500,000 x 3)	$1,500,000
Freight charges	$25,000
Handling fee	$12,000
Site preparation costs	$35,000
Start-up and testing costs	$18,000
Special wiring and material costs	$1,500
Cost basis	$1,591,500

(Note: start-up and testing costs = $15 x 40 x 6 x 5 = $18,000)

9.4

- Unrecognized profit

Old drill press (Book value)	$39,000
Trade-in allowance	$40,000
Unrecognized gains	$1,000

- Cost basis

Cost of a new drill	$126,000
Minus: unrecognized gains	$1,000
Cost basis of the new drill	$125,000

Comments: If the old drill was sold on the market (instead of trade-in), there will be no unrecognizable gain. In that situation, the cost basis for the new drill will be $126,000.

9.5

- Unrecognized profit
- \

Old lift truck (Book value)	$6,000
Trade-in allowance	$10,000
Unrecognized gains	$4,000

- Cost basis

Cost of new truck	$35,000
Minus: unrecognized gains	$4,000
Cost basis of new truck	$31,000

Comments: If the old truck was sold on the market (instead of trade-in), there will be no unrecognized gains. In that situation, the cost basis for the new truck will be $35,000.

Book Depreciation Methods

9.6

n	(a) SL		(b) DDB	
	D_n	B_n	D_n	B_n
1	$22,400	$109,600	$52,800	$79,200
2	$22,400	$87,200	$31,680	$47,520
3	$22,400	$64,800	$19,008	$28,512
4	$22,400	442,400	$8,512	$20,000
5	$22,400	$20,000	0	$20,000

9.7 Given: I = $150,000, n = 3 years, N = unspecified; Assuming that N ranges from 5 years to 8 years and the salvage value is no greater than $21,000, the DDB rates are as follows:

n	Depreciation Allowances			
	$N = 5$	$N = 6$	$N = 7$	$N = 8$
α	2/5	1/3	2/7	2/8
1	$60,000	$50,000	$42,857	$37,500
2	36,000	33,333	30,612	28,125
3	21,100	22,222	21,866	21,094

9.8 DDB switching to SL:

n	D_n	B_n
1	$14,286	$35,714
2	$10,204	$25,510
3	$7,290	$18,220
4	$5,205	$13,015
5	$4,340	$8,675
6	$4,335	$4,340
7	$4,340	0

9.9 Given: I = $68,000, S = $12,000, N = 6 years.

(a) $D_1 = \$22,667$, $D_2 = \$15,111$, $D_3 = \$10,074$

(b) DDB Switching to SL

n	D_n	B_n
1	\$22,667	\$45,333
2	\$15,111	\$30,222
3	\$10,074	\$20,148
4	\$6,716	\$13,432
5	**\$1,432**	\$12,000
6	\$0	\$12,000

Comments: If the regular DDB deduction is taken during the fourth year, B_4 would be less than the salvage value. Therefore, it is necessary to adjust D_4. The number in bold represents the adjusted depreciation allowance. No switching is common for this type of situation whenever the salvage value is high.

9.10 Given: $I = \$76{,}000$, $S = \$6{,}000$, $N = 8$ years

n	D_n	B_n
1	\$19,000	\$57,000
2	\$14,250	\$42,750
3	\$10,688	\$32,062
4	\$8,016	\$24,046
5	\$6,012	\$18,034
6	\$4,509	\$13,530
7	\$3,765	\$9,765
8	\$3,765	\$6,000

9.11

(a) $\alpha = 2.0\left(\frac{1}{5}\right) = 0.4$

(b) $D_1 = (0.4)(46{,}000) = \$18{,}400$

(c) $B_4 = (46{,}000)(1-0.4)^4 = \$5{,}962 < \$10{,}000,$ so $B_4 = \$10{,}000.$

9.12 Given: $I = \$35{,}000$, $N = 5$ years, $S = \$5{,}000$

n	(a) SL	(b) DDB	(c) SOYD
1	\$6,000	\$14,000	\$10,000
2	\$6,000	\$8,400	\$8,000
3	\$6,000	\$5,040	\$6,000
4	\$6,000	\$2,560	\$4,000
5	\$6,000	\$0	\$2,000

(Note: The SOYD method was not discussed in the text, as it is not used in current practice. It could be mentioned as one of the common book depreciation methods before 1986.)

9.13 Given: $I = \$68{,}000$, $S = \$9{,}500$, $N = 12$ years

(a) $$D = \frac{(\$68,000 - \$9,500)}{12} = \$4,875$$

(b) $$D_3 = \$7,870$$

(c) $$D_2 = \$8,250$$

Units-of-Production Method

9.14 Allowed depreciation amount

$$D = (\$0.38)(55,000) = \$20,900$$

9.15

$$D_{5,000 \text{ hours}} = \frac{\$65,000 - \$7,500}{50,000}(5,000)$$
$$= \$5,750$$

Tax Depreciation

9.16 Given: $I = \$32{,}000$, $S = \$5{,}000$, $N = 8$ years, and 5-year MACRS

n	Book Depreciation	MACRS Depreciation
1	\$3,375	\$6,400
2	\$3,375	\$10,240

3	$3,375	$6,144
4	$3,375	$3,686
5	$3,375	$3,686
6	$3,375	$1,844
7	$3,375	-
8	$3,375	-

9.17 (a) Cost basis: $\$220,000 + \$35,000 = \$255,000$

(b)

$$D_1 = \$36,439.5, D_2 = \$62,449.5, D_3 = \$44,599.5, D_4 = \$31,849.5$$
$$D_5 = D_6 = D_7 = \$22,711.5, D_8 = \$11,373$$

9.18 Let I denote the cost basis for the equipment.

$$\begin{aligned} B_3 &= I - (D_1 + D_2 + D_3)I \\ &= I - (0.1428 + 0.2449 + 0.1749)I \\ &= I - 0.5626I \\ &= 0.4374(\$145,000) \\ &= \$63,423 \end{aligned}$$

9.19 Given: I = \$86,000, S = \$12,000, N = 5 years, 7 year MACRS depreciation class

$$D_1 = \$12,289$$
$$D_2 = \$21,061$$
$$D_3 = \$15,041$$
$$D_4 = \$10,741$$
$$D_5 = \$7,680$$

9.20 Given: I = \$20,000, tax depreciation method = 6-year MACRS property class with half-year convention

n	B_{n-1}	200% DB D_n	life	SL D_n	MACRS D_n
1	\$20,000	\$3,333			\$3,333
2	\$16,667	\$5,556	5.5	\$3,030	\$5,556
3	\$11,111	\$3,704	4.5	\$2,469	\$3,704
4	\$7,407	\$2,649	3.5	\$2,116	\$2,649
5	\$4,938	\$1,646	2.5	\$1,975	\$1,975
6	\$3,292	\$549	1.5	\$1,975	\$1,975
7			0.5		\$988

□: Optimal time to switch

9.21 Since the land is not depreciable, the cost basis is \$200,000.
Given: I = \$200,000, tax depreciation method = 27.5-year MACRS property

n	Depreciation rate	Allowed depreciation
1	2.5758%	\$5,152
2	3.6364%	\$7,273
3	3.6364%	\$7,273
4	3.6364%	\$7,273
5	3.1818%	\$6,364

9.22 Given: I = \$26,000 and 7-year MACRS property

n	D_n
1	\$3,714
2	\$6,367
3	\$4,548
4	\$3,249
5	\$2,320
6	\$2,320
7	\$2,320
8	\$1,160

9.23 Given: Residential real property (27.5-year), $I = \$170{,}000$

(a)

$$D_1 = \left(\frac{100\%}{27.5}\right)\frac{2.5}{12}$$
$$= (0.00758)(\$170,000) = \$1,289$$

(b) Total amount of depreciation over the 4-year ownership, assuming that the asset is sold at the end of 4th calendar year:

n	Rate	D_n
1	0.7576%	\$1,289
2	3.6364%	\$6,182
3	3.6364%	\$6,182
4	3.4848%	\$5,924

Total amount of depreciation allowed = \$19,577. Note that the 4th year depreciation reflects the mid-month convention (11.5 months).

$$B_4 = \$170,000 - \$19,577 = \$150,423$$

9.24

Types of Asset	I	II	III	IV
Depreciating Methods	SL	DDB	UP	MACRS
End of year	7	4	3	4
Initial Cost(\$)	10,000	18,000	30,000	8,000
Salvage value(\$)	2,000	2,000	0	1,000
Book value(\$)	3,000	2,320	**15,000**	1,382
Depreciation life	8yr	5yr	90,000mi	**5yr**
Depreciable Amount(\$)	**1,000**	**1,555**	**5,000**	**921.60**
Accumulated Depreciable(\$)	**7,000**	15680	**15,750**	**6,618**

9.25 Given: $I = \$147{,}000$, $N = 10$ years, $S = \$27{,}000$, units produced = 250,000, and working hours = 30,000 hrs.

(a) Straight-line

$$D_{2006} = \frac{\$147,000 - \$27,000}{10} = \$12,000$$

(b) Units of Production Method

$$D_{2006} = \frac{23,450}{250,000}(\$147,000 - \$27,000) = \$11,256$$

(c) Working hours

$$D_{2006} = \frac{2,450}{30,000}(\$120,000) = \$9,800$$

(d) Double declining balance (no conversion to straight-line)

$$D_{2006} = \frac{2}{10}(\$147,000) = \$29,400$$

(e) Double declining balance with conversion to straight-line

$$D_{2006} = \frac{2}{10}(\$147,000) = \$29,400$$

Depletion

9.26

(a)

- Ore mine:

  $$\text{Depletion rate per ton} = \frac{\$6,900,000}{3,000,000} = \$2.3 \text{ per ton}$$

- Mining equipment:

  $$\text{Depreciation rate per ton} = \frac{\$2,700,000}{3,000,000} = \$0.9 \text{ per ton}$$

(b)

- For tax year 2006:
  Depletion expense = \$2.3(500,000) = \$1,150,000
  Depreciation expenses = \$0.9(500,000) = \$450,000

- For tax year 2006:
  Depletion expense = \$2.3(682,000) = \$1,568,600
  Depreciation expenses = \$0.9(682,000) = \$613,800

9.27

- $\text{Depletion arrowed per MBF} = \frac{\$400,000}{4.8 \text{ MBF}} = \$83,333 \text{ per MBF}$
- Total depletion allowance = \$83,333(1.5) = \$125,000

9.28 Percentage depletion versus cost depletion:

Gross Income	\$22,623,000
Depletion	× 15%
Computed % depletion	\$3,393,450

- Percentage depletion:

Gross Income	\$22,623,000
Expenses	\$12,250,000
Taxable income	\$10,373,000
Deduction limit	× 50%
Maximum depletion deduction	\$5,186,500

The allowable percentage deduction is \$3,393,450.

- Cost depletion = $\frac{\$40,000,000}{500,000}(52,000) = \$4,160,000$

$\therefore$ The cost depletion is more advantageous than the percentage depletion.

9.29

(a) Cost basis:

- Parcel A: $\frac{\$39,000,000}{9,000,000} = \$4.33 \text{ per bbl}$
- Parcel B: $\frac{\$24,000,000}{5,000,000} = \$4.80 \text{ per bbl}$

(b) Depletion charge for parcel A:

- Cost depletion: $\$4.33(1,200,000) = \$5,200,000$
- Percentage depletion:

- Gross income = \$16 × 1,200,000 = \$19,200,000

Gross Income	\$19,200,000
Depletion	× 15%
Computed % depletion	\$2,880,000

Gross Income	\$19,200,000
Expenses	\$3,600,000
Taxable income	\$15,600,000
Deduction limit	× 50%
Maximum depletion deduction	\$7,800,000

The allowable percentage deduction is $2,880,000.

(c) Percentage depletion versus cost depletion in year 2006:

	Parcel A	Parcel B
Gross Income	$17,000,000	$13,600,000
Depletion	× 15%	× 15%
Computed % depletion	$2,550,000	$2,040,000
Gross Income	$17,000,000	$13,600,000
Expenses	$3,600,000	$3,000,000
Taxable income	$13,400,000	$10,600,000
Deduction limit	× 50%	× 50%
Maximum depletion deduction	$6,700,000	$5,300,000

The allowable percentage deduction is $2,550,000.

(d) During year 2006, Oklahoma Oil claimed its depletion deduction in the amount of $2,040,000 from parcel B. This leaves the book value of $21,960,000 at the beginning of year 2007. The revised cost per bbl is

$$\frac{\$21,960,000}{4,000,000} = \$5.49 \text{ per bbl}$$

Since no gross income figure is available during year 2007, we may calculate the depletion charge based on unit cost as follows:

$$\$5.49(1,000,000) = \$5,490,000$$

9.30

(a) Cost depletion:

$$\text{Cost per ton} = \frac{\$30,000,000}{6,500,000} = \$4.6154 \text{ per ton}$$

$$\text{Depletion cost} = \$4.6154(1,000,000) = \$4,615,400$$

(b) Percentage depletion:

Gross Income	$600,000
Depletion	× 10%
Computed % depletion	$60,000
Gross Income	$600,000
Expenses	$450,000
Taxable income	$150,000

Deduction limit	$\times$ 50%
Maximum depletion deduction	$75,000

The allowable percentage deduction is $60,000.

Comments: Consider a situation where the extracted coal quality turned out to be very poor. This will result in insignificant market value. In this situation, certainly the use of cost depletion would allow the company to recover much of the loss to the extent of tax law permitting.

Revision of Depreciation Rates

9.31

(a) $D = \$800,000 / 25 = \$32,000$

(b) $B = \$400,000 + \$125,000 = \$525,000$

(c) Remaining years = (25 - 12.5) + 10 = 22.5 years

$D = \$525,000 / 22.5 = \$23,333$

9.32

(a) Book depreciation amount for 2006:

$$\begin{aligned} B_{2004} &= \$140,000 - 3(\$14,000) \\ &= \$98,000 \\ \text{revised depreciation basis} &= \$98,000 + \$25,000 \\ &= \$123,000 \\ \text{revised useful life} &= 12 \text{ years} \\ D_{2006} &= \$123,000 / 12 = \$10,250 \end{aligned}$$

(b) Tax depreciation amount for 2006:

- Depreciation schedule for the original machine:

$$D_{2006} = \$140,000(0.0893) = \$12,502$$

- Depreciation schedule for the improvement (treated as a separate MACRS property):

$$D_{2006} = \$25,000(0.1749) = \$4,373$$

$\therefore$ **Total tax depreciation for 2006:** $D_{2006} = \$12,502 + \$4,373 = \$16,875$

9.33 Given: Cost basis = $75,000 + $4,500 = $79,500

(a) Book depreciation schedule (Depreciation basis = $75,000)

n	D_n	B_n
2004	$6,250	$73,250
2005	$6,250	$67,000
2006	$6,250	$60,750
2007	**$6,250**	$54,500

(b) Tax depreciation schedule (Depreciation basis = $79,500)

n	D_n	B_n
2004	$11,361	$68,139
2005	$19,470	$48,670
2006	$13,905	$34,765
2007	**$9,930**	$24,836

Comments: The accessories costing $5,000 that were incurred in 2006 do not change the depreciation schedule, because these neither extended the machine's life nor resulted in any additional salvage value.

Corporate Tax Systems

9.34 Net income calculation:

Gross income	$ 25,000,000
Expenses:	
Salaries	$ 5,000,000
Wages	$ 4,000,000
Depreciation	$ 800,000
Loan interest	$ 210,000
Taxable income	$ 14,990,000
Income taxes	$ 5,146,500
Net income	$ 9,843,500

Note: Income taxes = $3,400,000 + 0.35(14,990,000 - 10,000,000)

9.35

(a) Taxable income = $8,500,000 - $2,280,000 - $456,000 = $5,764,000

(b) Income tax calculation using tax formula

$$\text{Income taxes} = \$113{,}900 + 0.34(5{,}764{,}000 - 335{,}000) = \$1{,}959{,}760$$

9.36 (a) Income tax liability:

Gross revenues	$ 1,200,000
Expenses:	
Manufacturing	$ 450,000
Operating	$ 120,000
Interest	$ 40,000
Taxable operating income	$ 590,000
Adjustment: loss	$ 15,000
Taxable income	$ 575,000
Income taxes	$ 195,500
Net income	$ 379,500

Note: book loss = $60,000 - $75,000 = ($15,000)

(b) Operating income:

Taxable operating income	$590,000
Income taxes	$200,600
Net operating income	$389,400

Gains or Losses

9.37 (a) Disposed of in year 3:

$$\begin{aligned}\text{allowed depreciation} &= \$60{,}000(0.20 + 0.32 + 0.192/2) \\ &= \$36{,}960 \\ \text{book value} &= \$60{,}000 - \$36{,}960 \\ &= \$23{,}040 \\ \text{loss} &= \$20{,}000 - \$23{,}040 = (\$3{,}040)\end{aligned}$$

(b) Disposed of in year 5:

$$\begin{aligned}\text{allowed depreciation} &= \$60,000(0.20+0.32+0.192\\ &\quad +0.1152+0.1152/2)\\ &= \$53,088\\ \text{book value} &= \$60,000-\$53,088\\ &= \$6,912\\ \text{Taxable gains} &= \$10,000-\$6,912=\$3,088\end{aligned}$$

(c) Disposed of in year 6:

$$\begin{aligned}\text{allowed depreciation} &= \$60,000\\ \text{book value} &= \$0\\ \text{Taxable gains} &= \$5,000\end{aligned}$$

9.38

$$\begin{aligned}\text{Allowed depreciation} &= \$300,000(0.1419+0.2449+0.1749\\ &\quad +0.1249+0.0893/2)\\ &= \$219,660\\ \text{book value} &= \$300,000-\$219,660\\ &= \$80,340\end{aligned}$$

(a) If sold at \$10,000:

$$\begin{aligned}\text{loss} &= \$10,000-\$80,340=(\$70,340)\\ \text{loss credit} &= \$70,340(0.34)=\$23,916\end{aligned}$$

(b) If sold at \$125,460:

$$\begin{aligned}\text{gain} &= \$125,460-\$80,340=\$45,120\\ \text{gains tax} &= \$45,120(0.34)=\$15,341\end{aligned}$$

(c) If sold at \$200,000:

$$\begin{aligned}\text{gain} &= \$200,000-\$80,340=\$119,660\\ \text{gains tax} &= \$119,660(0.34)=\$40,684.40\end{aligned}$$

9.39 Given: $I = \$50{,}000$, $S = \$1{,}000$, $N = 10$ years.

(a) Book value on December 31, 2007 using SL depreciation method

n	D_n	B_n
2004	\$4,900	\$45,100
2005	\$4,900	\$40,200
2006	\$4,900	\$35,300
2007	\$4,900	**\$30,400**

(b) Depreciation amount for 2007 using DDB

n	D_n	B_n
2004	\$10,000	\$40,000
2005	\$8,000	\$32,000
2006	\$6,400	\$25,600
2007	**\$5,120**	\$20,480

(c) Optimal time to switch: year 2010

(d) Taxable gain

$$\begin{aligned}\text{allowed depreciation} &= \$50,000(0.1429 + 0.2449 + 0.1749 + 0.1249/2)\\ &= \$31,257\\ \text{book value} &= \$50,000 - \$31,257\\ &= \$18,743\\ \text{Taxable gains} &= \$30,000 - \$18,743 = \$11,258\end{aligned}$$

Comments: If a MACRS asset is disposed of during the recovery period, the half-year convention must be applied to determine the allowed depreciation amount for the year of asset disposal.

Marginal Tax Rate in Project Evaluation

9.40

(a) Economic depreciation for the milling machine

$$\$200,000 - \$30,000 = \$170,000$$

(b) Marginal tax rates with the project:

n	Project revenue	D_n	Taxable income	Combined income	Marginal rate
1	\$80,000	\$40,000	\$40,000	\$365,000	34%
2	\$80,000	\$64,000	\$16,000	\$341,000	34%
3	\$80,000	\$38,400	\$41,600	\$366,600	34%
4	\$80,000	\$23,040	\$56,960	\$381,960	34%
5	\$80,000	\$23,040	\$59,960	\$381,960	34%
6	\$80,000	\$11,520	\$68,480	\$393,480	34%

(c) Average tax rates

n	Combined taxable income	Combined income taxes	Average tax rate
1	\$365,000	\$124,100	34.00%
2	\$341,000	\$115,940	34.00%
3	\$366,600	\$124,644	34.00%
4	\$381,960	\$129,866	34.00%
5	\$381,960	\$129,866	34.00%
6	\$393,480	\$133,783	34.00%

9.41 Incremental tax rate calculation:

	Year 1	Year 2
Revenue	\$ 200,000	\$ 200,000
Operating costs	\$ 100,000	\$ 100,000
Depreciation	\$ 10,000	\$ 16,000
Taxable income	\$ 90,000	\$ 84,000

	Year 1	Year 2
Taxable income without project	\$ 550,000	\$ 550,000
Income taxes	\$ 187,000	\$ 187,000
Taxable income with project	\$ 640,000	\$ 634,000
Income taxes	\$ 217,600	\$ 215,560
Incremental taxable income	\$ 90,000	\$ 84,000
Incremental income taxes	\$ 30,600	\$ 28,560
Incremental tax rate (%)	0.34	0.34

Comments: Note that the marginal tax rates over the project life remain unchanged because the additional income from the new project is not large enough to push the company into a higher tax bracket (35%).

9.42

	Economic Condition		
	Good	Fair	Poor
Taxable income			
Before expansion	$ 2,000,000	$ 2,000,000	$ 2,000,000
Due to expansion	$ 2,000,000	$ 500,000	$ (100,000)
After expansion	$ 4,000,000	$ 2,500,000	$ 1,900,000
Income Taxes	$ 1,360,000	$ 850,000	$ 646,000
(a) Marginal tax rate	34%	34%	34%
(b) Average tax rate	34%	34%	34%

9.43 Incremental tax calculations:

(a) Additional taxable income due to project:

	Year		
	1	2	3
Annual revenue	$80,000	$80,000	$80,000
Operating cost	$20,000	$20,000	$20,000
Depreciation	$16,665	$22,220	$3,702
Taxable income	$43,335	$37,780	$56,298

(b) Additional income tax calculation:

Year 1	Without project	With project	Project alone
Taxable income	$300,000	$343,335	$43,335
Income taxes	$100,250	$116,734	$16,484

Year 2	Without project	With project	Project alone
Taxable income	$300,000	$337,780	$37,780
Income taxes	$100,250	$114,845	$14,595

Year 3	Without project	With project	Project alone
Taxable income	$300,000	$356,298	$56,298
Income taxes	$100,250	$121,141	$20,891

(c) Gain taxes:

$$\text{total depreciation} = \$42,587$$

$$\text{book value} = \$50,000 - \$42,587 = \$7,413$$

$$\text{Taxable gains} = \$10,000 - \$7,413 = \$2,587$$

$$\text{Gain taxes} = (0.34)(\$2,587) = \$880$$

Combined Marginal Income Tax Rate

9.44

(a) Explicit calculation of state income taxes:

$$\text{state taxable income} = \$2,000,000 - \$1,200,000 = \$800,000$$

$$\text{state income taxes} = \$800,000(0.06) = \$48,000$$

$$\text{federal taxable income} = \$800,000 - \$48,000 = \$752,000$$

$$\text{federal income taxes} = \$752,000(0.34) = \$255,680$$

$$\therefore \text{ Combined taxes} = \$303{,}680$$

(b) Tax calculation based on the combined tax rate:

$$\text{combined tax rate} = 0.34 + 0.06 - (0.06)(0.34) = 37.96\%$$

$$\therefore \text{ Combined taxes} = (0.3796)(\$800{,}000) = \$303{,}680$$

9.45

(a) Marginal tax rates:

$$\text{state taxable income} = \$4,500,000 - \$2,450,000 - \$630,000 = \$1,420,000$$

$$\text{state tax rate} = \frac{\$193{,}120}{\$1,420,000} = 13.6\%$$

$$\text{federal taxable income} = \$1,420,000 - \$193{,}120 = \$1,226,880$$

$$\text{federal tax rate} = \frac{\$352{,}000}{\$1,226,880} = 28.69\%$$

(b)
$$\text{combined marginal tax rate} = 0.136 + 0.2869 - (0.136)(0.2869) = 38.39\%$$

9.46

(a) Additional annual taxable income due to expansion = $20,000
Taxable income (combined) in year 1 = $70,000 + $20,000 = $90,000

$\therefore$ The marginal tax rate after business expansion is 34%

(b) Average tax rate after business expansion = $18,850 / $90,000 = 20.94%

(c) PW of income taxes:

- Depreciation schedules: depreciation base = $20,000

n	MACRS
1	$ 6,666
2	$ 8,890
3	$ 2,962
4	$ 1,482

- Incremental income taxes under 3-year MACRS

	Operating Year		
	Year 1	Year 2	Year 3
Revenue	$ 30,000	$ 30,000	$ 30,000
Expense	$ 10,000	$ 10,000	$ 10,000
Depreciation	$ 6,666	$ 8,890	$ 2,962
Taxable income	$ 13,334	$ 11,110	$ 17,038
Income taxes	$ 4,084	$ 3,328	$ 5,342

$\therefore$ PW of income taxes:

$$\begin{aligned} PW(10\%) &= \$4,084(P/F,10\%,1) + \$3,328(P/F,10\%,2) \\ &\quad + \$5,342(P/F,10\%,3) \\ &= \$10,477 \end{aligned}$$

9.47

n	D_n	(a) B_{n-1}	(b) taxes
1	$ 500,000	$3,500,000	$42,000
2	$ 857,150	$3,000,000	$36,000
3	$ 612,150	$2,142,850	$25,714
4	$ 437,150	$1,530,700	$18,368
5	$ 312,550	$1,093,550	$13,123

6	$ 312,200	$781,000	$9,372
7	$ 312,550	$468,800	$5,626
8	$ 156,100	$156,250	$1,875

Short Case Studies

ST 9.1 Given: $I = \$63{,}000 + \$2{,}000 = \$65{,}000$, $N = 10$ years, $S = \$4{,}000$

- Book depreciation expenses for 2000:

$$D_{2000} = \frac{\$65,000 - \$4,000}{10} = \$6,100$$

n	D_n	B_n
2000	$6,100	$58,900
2001	$6,100	$52,800
2002	$6,100	$46,700

- Book depreciation expenses for 2003:

$$\text{new depreciation basis} = \$46,700 + \$6,000 = \$52,700$$
$$\text{remaining useful life} = 10 \text{ years}$$
$$\text{salvage vlaue} = \$4,000$$

$$\therefore\ D_{2003} = \frac{\$52,700 - \$4,000}{10} = \$4,870$$

n	D_n	B_n
2003	$4,870	$47,830
2004	$4,870	$42,960
2005	$4,870	$38,090

- Book depreciation expenses for 2006:

$$\text{new depreciation basis} = \$38,090 + \$3,000 = \$41,090$$
$$\text{remaining useful life} = 7 \text{ years}$$
$$\text{salvage vlaue} = \$6,000$$

$$\therefore\ D_{2006} = \frac{\$41,090 - \$6,000}{7} = \$5,013$$

ST 9.2

(a) Depletion basis = \$11.6 million - \$2 million = \$9.6 million

Depletion allowance per bbl = $\frac{\$9,600,000}{4,000,000} = \$2.4 \text{ per bbl}$

Cost depletion for 2006 = $\$2.4/\text{bbl} \times 420,000\text{bbls} = \$1,008,000$

Cost depletion for 2006 = $\$2.4/\text{bbl} \times 510,000\text{bbls} = \$1,224,000$

(b) Depletion basis = equipment cost + pipeline cost = \$3,360,000

Depletion allowance per bbl = $\frac{\$3,360,000}{4,000,000} = \$0.84 \text{ per bbl}$

Cost depletion for 2006 = $\$0.84/\text{bbl} \times 420,000\text{bbls} = \$352,800$

Cost depletion for 2006 = $\$0.84/\text{bbl} \times 510,000\text{bbls} = \$428,400$

ST 9.3

(a) Book depreciation methods:

- Straight-line method:

n	D_n	B_n	Cumulative D_n
1	\$12,000	\$53,000	\$12,000
2	\$12,000	\$41,000	\$24,000
3	\$12,000	\$29,000	\$36,000
4	\$12,000	\$17,000	\$48,000
5	\$12,000	\$5,000	\$60,000

- DDB method:

n	D_n	B_n	Cumulative D_n
1	\$26,000	\$39,000	\$26,000
2	\$15,600	\$23,400	\$41,600
3	\$9,360	\$14,040	\$50,960
4	\$5,616	\$8,424	\$56,576
5	\$3,424	\$5,000	\$60,000

(b) Tax depreciation: 7-year MACRS

n	D_n	B_n	Cumulative D_n
1	\$9,289	\$55,711	\$9,289
2	\$15,919	\$39,792	\$25,208
3	\$11,369	\$28,423	\$36,577
4	\$8,118	\$20,305	\$44,695
5	\$5,804	\$14,501	\$50,499
6	\$5,798	\$8,703	\$56,297
7	\$5,804	\$2,899	\$62,101
8	\$2,900	0	\$65,000

(c) Trade-in allowance

Book value of the old lathe (B_3)	\$28,423
Less: Trade-in allowance	10,000
Unrecognized loss	(\$18,423)
Cost of new lathe	\$82,000
Plus: Unrecognized loss on trade-in	\$18,423
Cost basis of new lathe	\$100,423

Comments: If the old drill was sold on the market (instead of trade-in), there would be no unrecognized loss. In that situation, the cost basis for the new drill will be just \$82,000. No half-year convention is assumed in the analysis.

ST 9.4

(a) Incremental Operating income:

	Operating Costs	
	Year 1	Year 2
Revenue	\$15,000,000	\$15,000,000
Expenses:		
Mfg. cost	\$6,000,000	\$6,000,000
O&M costs	\$1,200,000	\$1,200,000
Depreciation	\$714,500	\$1,224,500
Taxable income	\$7,085,500	\$6,575,500
Income taxes (35%)	\$2,479,925	\$2,301,425
Net income	\$4,605,575	\$4,274,075

Year 3	Year 4	Year 5
$15,000,000	$15,000,000	$15,000,000
$6,000,000	$6,000,000	$6,000,000
$1,200,000	$1,200,000	$1,200,000
$874,500	$624,500	$223,000
$6,575,500	$7,175,500	$7,577,000
$2,423,925	$2,511,425	$2,651,950
$4,274,075	$4,664,075	$4,925,050

(b) Gains or losses:

$$\begin{aligned}\text{total depreciation} &= \$3,661,000\\ B_5 &= \$5,000,000 - \$3,661,000\\ &= \$1,339,000\\ \text{taxable gains} &= \$1,600,000 - \$1,339,000\\ &= \$261,000\end{aligned}$$

ST 9.5

(a) If Diamond invests in the facilities and markets the product successfully, the expected taxable income in each year will remain at 34%. Since the local and state taxes are tax-deductible expenses on federal tax calculation purpose, the combined marginal tax rate is

$$t_m = 0.34 + 0.05 - (0.05)(0.34) = 37.3\%$$

(b) Gains or losses

- Plant (39-year MACRS):

$$\begin{aligned}\text{total depreciation} &= (2.4573\% + 2.5641\% + \cdots + 2.4573\%)(\$10,000,000)\\ &= \$2,029,913\\ B_8 &= \$10,000,000 - \$2,029,913\\ &= \$7,970,087\\ \text{losses} &= \$6,000,000 - \$7,970,087\\ &= (\$1,970,087)\end{aligned}$$

- Equipment (7-year MACRS):

$$\text{total depreciation} = \$40,000,000$$
$$B_8 = 0$$
$$\text{Ordinary gains} = \$4,000,000$$

- Net gains:

$$\begin{aligned}\text{net gains} &= \$4,000,000 - \$1,970,087\\ &= \$2,029,913\\ \text{gains tax}(37.3\%) &= \$2,029,913 \times 0.373\\ &= \$757,158\\ \text{net proceeds from sales} &= \$10,000,000 - \$757,158\\ &= \$9,242,842\end{aligned}$$

(c) Net operating income

Income Statement (all units in thousand dollars)

n	1	2	3	4	5	6	7	8
Revenue	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000
Expenses :								
Mfg. cost	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Operating cost	12000	12000	12000	12000	12000	12000	12000	12000
Depreciation								
Building	246	256	256	256	256	256	256	246
Equipment	5716	9796	6996	4996	3568	3568	3568	1784
Taxable Income for State	$3,038	($1,052)	$1,748	$3,748	$5,176	$5,176	$5,176	$6,970
State Income taxes (5%)	152	(53)	87	187	259	259	259	349
Taxable Income for Federal	$2,886	($999)	$1,661	$3,561	$4,917	$4,917	$4,917	$6,622
Federal Income taxes (34%)	981	(340)	565	1,211	1,672	1,672	1,672	2,251
Net Income	$1,905	($660)	$1,096	$2,350	$3,245	$3,245	$3,245	$4,370

Corporate operating losses: Ordinary operating losses (say, year 2) can be carried back to each of the preceding 3 years and forward for the following 15 years, and can be used to offset taxable income in those years. In our example, the taxable income during the first year is large enough to offset the operating loss during the second year, so that the corporation will get a tax refund in the amount of $ 340,000 at the end of year 2.