



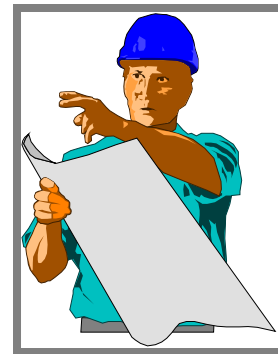
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# **ENGINEERING ECONOMICS**

## **Income Tax & Discounted Cash-flow model**



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**Lecture 13**



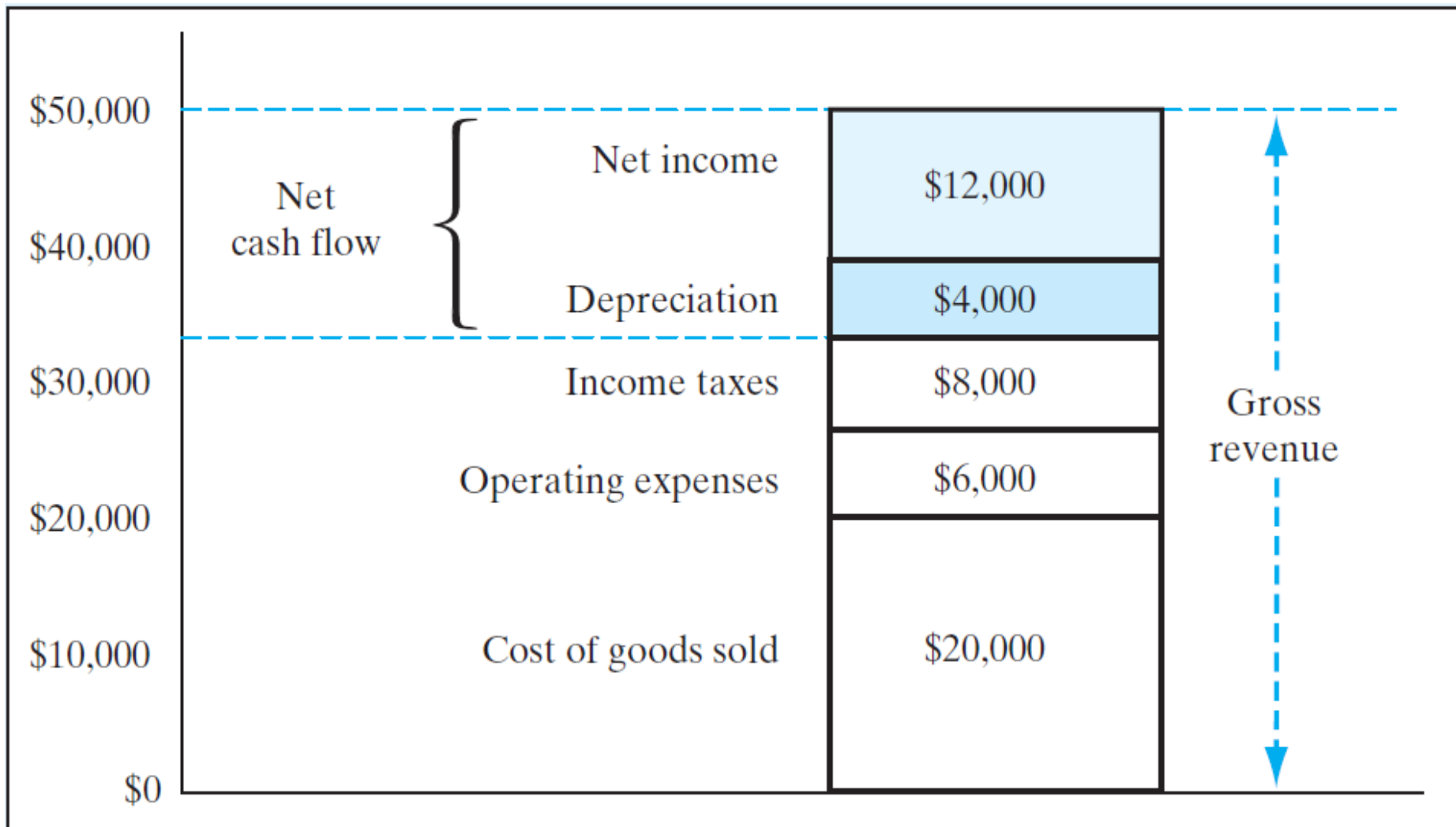
# Cash Flow versus Net Income

Item
<b>Gross income</b>
Expenses:
Cost of goods sold
Depreciation
Operating expenses
Taxable operating income
Income taxes
<b>Net income</b>
<b>Net cash flow = Net income + Depreciation</b>

# Cash Flow versus Net Income

Item	Income	Cash Flow
Gross income (revenues)	\$50,000	\$50,000
Expenses:		
Cost of goods sold	20,000	−20,000
Depreciation	4,000	
Operating expenses	<u>6,000</u>	−6,000
Taxable income	20,000	
Taxes (40%)	<u>8,000</u>	−8,000
Net income	\$12,000	<u>          </u>
Net cash flow		\$16,000

# Cash Flow versus Net Income



# Cash Flow versus Net Income

## Income statement

Revenues
Expenses
Cost of goods sold
Depreciation
Debt interest
Operating expenses
<hr/>
Taxable income
Income taxes
<hr/>
Net income

## Cash flow statement

+ Net income  
+ Depreciation

← Operating activities

– Capital investment  
+ Proceeds from sales of depreciable assets  
– Gains tax  
– Investments in working capital  
+ Working capital recovery

+  
← Investing activities

+ Borrowed funds  
– Repayment of principal

← Financing activities

Net cash flow

# US Corporate Tax Schedule for 2006

Taxable Income ( $X$ )	Tax Rate	Tax Computation Formula
\$0–\$50,000	15%	$\$0 + 0.15X$
50,001–75,000	25%	$7,500 + 0.25(X - \$50,000)$
75,001–100,000	34%	$13,750 + 0.34(X - 75,000)$
100,001–335,000	34% + 5%	$22,250 + 0.39(X - 100,000)$
335,001–10,000,000	34%	$113,900 + 0.34(X - 335,000)$
10,000,001–15,000,000	35%	$3,400,000 + 0.35(X - 10,000,000)$
15,000,001–18,333,333	35% + 3%	$5,150,000 + 0.38(X - 15,000,000)$
18,333,334 and up	35%	$6,416,666 + 0.35(X - 18,333,333)$

**four basic rate brackets (15%, 25%, 34%, and 35%),  
plus two surtax rates (5% and 3%)**

# Marginal and Effective Tax Rates

**Marginal tax rate:** The amount of tax paid on an additional dollar of income.

**Effective (average) tax rate:** The rate a taxpayer would be taxed at if taxing was done at a constant rate, instead of progressively.

# Marginal and Effective Tax Rates

For example, if a corporation had a taxable **income of \$16,000,000** in 2006, then the income tax owed by the corporation would be as follows:

Taxable Income	Tax Rate	Taxes	Cumulative Taxes
First \$50,000	15%	\$7,500	\$7,500
Next \$25,000	25%	6,250	13,750
Next \$25,000	34%	8,500	22,250
Next \$235,000	39%	91,650	113,900
Next \$9,665,000	34%	3,286,100	3,400,000
Next \$5,000,000	35%	1,750,000	5,150,000
Remaining \$1,000,000	38%	380,000	\$5,530,000

**Marginal Tax Rate**



# Marginal and Effective Tax Rates

Alternatively, using the tax formulas in Table 9.6, we obtain

$$\$5,150,000 + 0.38(\$16,000,000 - \$15,000,000) = \$5,530,000.$$

The effective (average) tax rate would then be

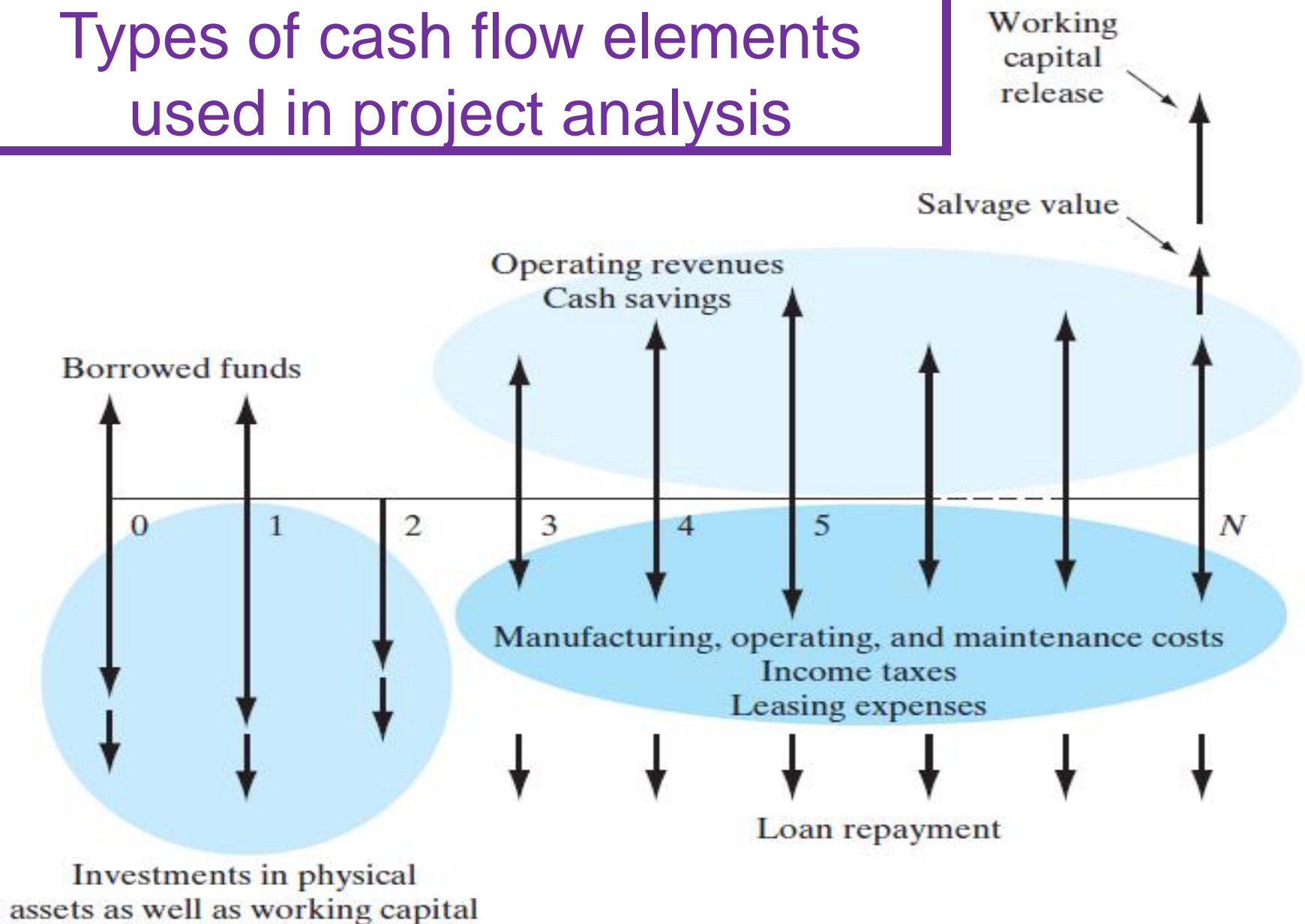
$$\frac{\$5,530,000}{\$16,000,000} = 0.3456, \text{ or } 34.56,$$

**Effective Tax Rate**

as opposed to the marginal rate of 38%. In other words, on the average, the company paid 34.56 cents for each taxable dollar it generated during the accounting period.

**Nepalese Tax Rates**

# Types of cash flow elements used in project analysis



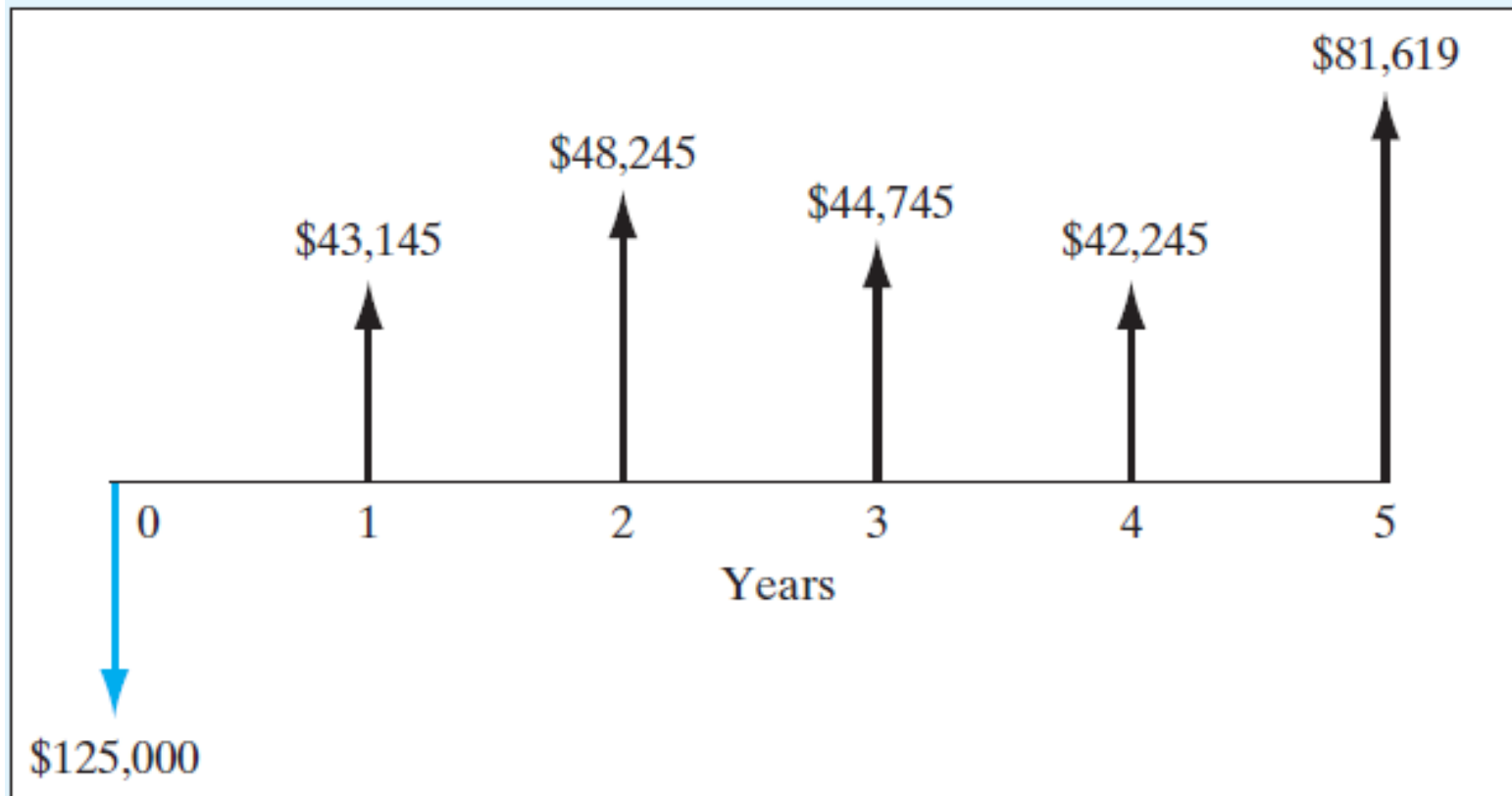
# Classifying Cash Flow Elements and Their Equivalent Terms as Practiced in Business

Cash Flow Element	Other Terms Used in Business
<b>Operating activities:</b>	
Gross income	Gross revenue, sales revenue, gross profit, operating revenue
Cost savings	Cost reduction
Manufacturing expenses	Cost of goods sold, cost of revenue
Operations and maintenance cost	Operating expenses
Operating income	Operating profit, gross margin
Interest expenses	Interest payments, debt cost
Income taxes	Income taxes owed
<b>Investing activities:</b>	
Capital investment	Purchase of new equipment, capital expenditure
Salvage value	Net selling price, disposal value, resale value
Investment in working capital	Working-capital requirement
Release of working capital	Working-capital recovery
Gains taxes	Capital gains taxes, ordinary gains taxes
<b>Financing activities:</b>	
Borrowed funds	Borrowed amounts, loan amount
Repayment of principal	Loan repayment

# Cash Flow Statement Example

Year	0	1	2	3	4	5
<b>Income Statement</b>						
Revenues		\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Expenses						
Labor		20,000	20,000	20,000	20,000	20,000
Material		12,000	12,000	12,000	12,000	12,000
Overhead		8,000	8,000	8,000	8,000	8,000
Depreciation		17,863	30,613	21,863	15,613	5,581
Taxable income		\$ 42,137	\$ 29,387	\$ 38,137	\$ 44,387	\$ 54,419
Income taxes (40%)		16,855	11,755	15,255	17,755	21,768
Net income		\$ 25,282	\$ 17,632	\$ 22,882	\$ 26,632	\$ 32,651
<b>Cash Flow Statement</b>						
Operating activities						
Net income		25,282	17,632	22,882	26,632	32,651
Depreciation		17,863	30,613	21,863	15,613	5,581
Investment activities						
Investment	(125,000)					
Salvage						50,000
Gains tax						(6,613)
Net cash flow	\$(125,000)	\$ 43,145	\$ 48,245	\$ 44,745	\$ 42,245	\$ 81,619

# Cash flow diagram and Financial Analysis

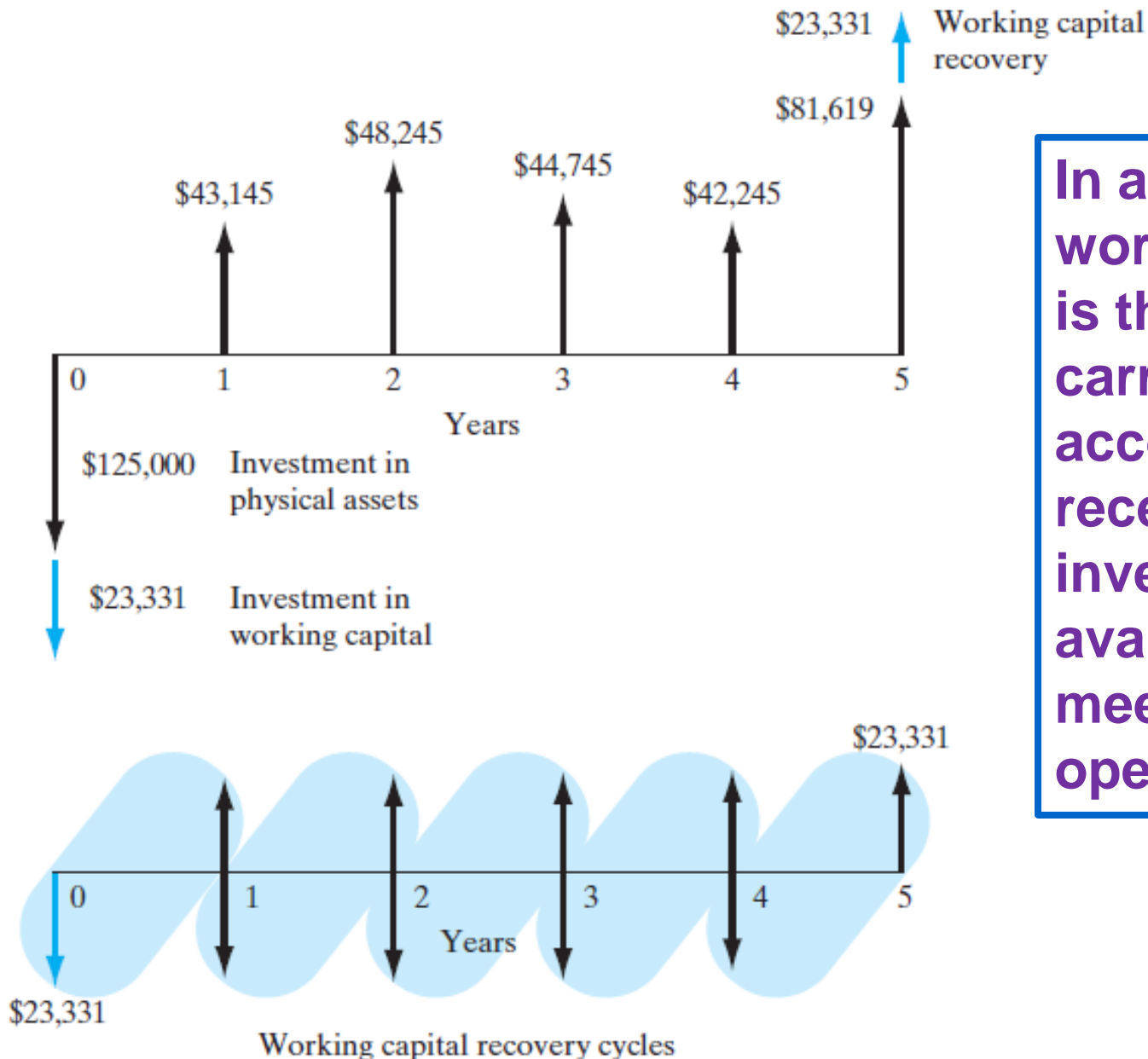


$$\begin{aligned} PW(15\%) &= -\$125,000 + \$43,145(P/F, 15\%, 1) \\ &\quad + \$48,245(P/F, 15\%, 2) + \$44,745(P/F, 15\%, 3) \\ &\quad + \$42,245(P/F, 15\%, 4) + \$81,619(P/F, 15\%, 5) \\ &= \$43,152. \end{aligned}$$

# Cash Flow Statement with Working Capital

Year	0	1	2	3	4	5
<b>Income Statement</b>						
Revenues		\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Expenses						
Labor		20,000	20,000	20,000	20,000	20,000
Material		12,000	12,000	12,000	12,000	12,000
Overhead		8,000	8,000	8,000	8,000	8,000
Depreciation		<u>17,863</u>	<u>30,613</u>	<u>21,863</u>	<u>15,613</u>	<u>5,581</u>
Taxable income		\$ 42,137	\$ 29,387	\$ 38,137	\$ 44,387	\$ 54,419
Income taxes (40%)		<u>16,855</u>	<u>11,755</u>	<u>15,255</u>	<u>17,755</u>	<u>21,768</u>
Net income		\$ 25,282	\$ 17,632	\$ 22,882	\$ 26,632	\$ 32,651
<b>Cash Flow Statement</b>						
Operating activities						
Net income		25,282	17,632	22,882	26,632	32,651
Depreciation		17,863	30,613	21,863	15,613	5,581
Investment activities						
Investment	(125,000)					
Salvage						50,000
Gains tax						(6,613)
Working capital	<u>(23,331)</u>					<u>23,331</u>
Net cash flow	\$ (148,331)	\$ 43,145	\$ 48,245	\$ 44,745	\$ 42,245	\$ 104,950

# Cash Flow with Working Capital



**In accounting, working capital is the amount carried in cash, accounts receivable, and inventory that is available to meet day-to-day operating needs.**



Year	0	1	2	3	4	5	6	7	8	9	10
<b>Income Statement</b>											
Revenues		\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000
Expenses											
Materials		22,000	22,000	22,000	22,000	22,000	22,000	22,000	22,000	22,000	22,000
Labor		32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000
Energy		3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Other		2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Depreciation											
Building		2,949	3,077	3,077	3,077	3,077	3,077	3,077	3,077	3,077	2,949
Machines		14,290	24,490	17,490	12,490	8,930	8,920	8,930	4,460		
Tools		4,000	5,333	1,778	889		4,000	5,333	1,778	889	
Taxable income		68,761	57,100	67,655	73,544	77,993	74,003	72,660	80,685	86,034	87,051
Income taxes		27,504	22,840	27,062	29,418	31,197	29,601	29,064	32,274	34,414	34,820
Net income		\$ 41,257	\$ 34,260	\$ 40,593	\$ 44,126	\$ 46,796	\$ 44,402	\$ 43,596	\$ 48,411	\$ 51,620	\$ 52,231
<b>Cash Flow Statement</b>											
Operating activities:											
Net income		41,257	34,260	40,593	44,126	46,796	44,402	43,596	48,411	51,620	52,231
Depreciation		21,239	32,900	22,345	16,456	12,007	15,997	17,340	9,315	3,966	2,949
Investment activities:											
Land	(40,000)										110,000
Building	(120,000)										80,000
Machines	(100,000)										10,000
Tools (first cycle)	(12,000)					1,000					
Tools (second cycle)						(12,000)					1,000
Gains tax:											
Land									(28,000)		
Building											3,794
Machines											(4,000)
Tools						(400)					(400)
Net cash flow	\$ (272,000)	\$ 62,496	\$ 67,160	\$ 62,938	\$ 60,582	\$ 47,403	\$ 60,399	\$ 60,936	\$ 57,726	\$ 55,586	\$227,574



# Practice

- 9.38, 9.39, 9.40, 10.2, 10.5, 10.13, 10.17, 10.22, 10.25, 10.27

**End**