

1. **Unit-level activity:** performed for each unit sold.
2. **Order-level activity:** performed for each sales order.
3. **Customer-level activity:** performed to obtain or maintain each customer.
4. **Facility-level activity:** performed to maintain the general manufacturing function.

This classification scheme assists in answering questions concerning the cost of individual orders or individual customers.

If an organization sells to distinct market segments (for profit, not for profit, and government), the cost hierarchy can be modified as follows:

1. Unit-level activity
2. Order-level activity
3. Customer-level activity
4. **Market-segment-level activity:** performed to obtain or maintain operations in a segment.
5. Facility-level activity

The market-segment-level activities and their related costs differ with each market segment. This classification scheme assists in answering questions concerning the profitability of each segment.

Finally, an organization that completes unique projects for different market segments (such as buildings for **IBM** and the **U.S. Department of Defense**) can use the following hierarchy to determine the profitability of each segment:

1. **Project-level activity:** performed to support the completion of each project.
2. Market-segment-level activity
3. Facility-level activity

The possibilities are endless. The important point is that both the cost hierarchy and the costs included in the hierarchy be tailored to meet the specific circumstances of an organization and the interests of management.

Review 2-5 LO5



Customer Cost Hierarchy Consider the pizza chain **Blaze Pizza**. They custom build and cook each pizza to order. Items **1-6** represent cost activities a particular store might incur.

1. Pepperoni on the pizza
2. Wood to fuel the fire used to cook the pizzas
3. Insurance on the building
4. The labor hours worked by the employee building and cooking each pizza
5. The sales calls made to local organizations to promote the pizzas for catering special events
6. The number of pizza orders received

Required

Classify each cost activity above, in the most appropriate level of the proposed customer cost hierarchy. Each cost activity may be used more than once.

- _____ a. Unit-level—performed for each unit sold
- _____ b. Order-level—performed for each sales level
- _____ c. Customer-level—performed to obtain or maintain each customer
- _____ d. Store(facility)-level—performed to maintain the general store functions

Solution on p. 67.

$$b = \frac{\$1,575 \text{ total variable costs}}{2,100 \text{ units}} \\ = \$0.75X$$

Wages and salaries were previously classified as a mixed cost. Hence, the cost of wages and salaries is determined using the high-low method.

$$\text{(variable cost)} \quad b = \frac{\$1,675 - \$1,525}{2,700 - 2,100} \\ = 0.25X$$

$$\text{(fixed cost)} \quad a = \$1,525 \text{ total cost} - (\$0.25 \times 2,100) \text{ variable cost} \\ = \$1,000$$

Rent on building was classified as a fixed cost.

$$a = \$1,500$$

Total monthly costs most likely follow a mixed cost behavior pattern. Hence, they can be determined using the high-low method.

$$b = \frac{\$6,556 - \$5,848}{2,700 - 2,100} \\ = \$1.18X \\ a = \$5,848 - (\$1.18 \times 2,100) \\ = \$3,370 \\ \text{Total costs} = \$3,370 + \$1.18X$$

where

$$X = \text{unit sales}$$

b. and c.

Volume	Total Costs	Average Cost per Sandwich
1,000.	$\$3,370 + (\$1.18 \times 1,000) = \$4,550$	$\frac{\$4,550}{1,000} = \4.550
2,000.	$\$3,370 + (\$1.18 \times 2,000) = \$5,730$	$\frac{\$5,730}{2,000} = \2.865

The average costs differ at 1,000 and 2,000 units because the fixed costs are being spread over a different number of units. The larger the number of units, the smaller the average fixed cost per unit.

Review 2-4—Solution

Some common activity drivers for stating volume of activity in a manufacturing operation might include direct labor hours, machine hours, units of material produced, and units of finished product. The selection of the most appropriate basis requires judgment and professional experience. The relationship between the activity cost driver and the cost must seem logical and the activity data must be available.

Review 2-5—Solution

1. a; Unit-level
2. b; Store-level
3. c; Store-level
4. d; Unit-level
5. e; Customer-level
6. f; Order-level

- b. The Collings College Student Association is planning a fall concert. Expected costs (renting a hall, hiring a band, etc.) are \$30,000. Assuming 3,000 people attend the concert, determine the break-even price per ticket. How much will the association lose if this price is charged and only 2,700 tickets are sold?
- c. City Hospital has a contract with the city to provide indigent health care on an outpatient basis for \$25 per visit. The patient will pay \$5 of this amount, with the city paying the balance (\$20). Determine the amount the city will pay if the hospital has 10,000 patient visits.
- d. A civic organization is engaged in a fund-raising program. On Civic Sunday, it will sell newspapers at \$1.25 each. The organization will pay \$0.75 for each newspaper. Costs of the necessary permits, signs, and so forth are \$500. Determine the amount the organization will raise if it sells 5,000 newspapers.
- e. Christmas for the Needy is a civic organization that provides Christmas presents to disadvantaged children. The annual costs of this activity are \$5,000, plus \$10 per present. Determine the number of presents the organization can provide with \$20,000.

LO3, 5**E3-21. Alternative Production Procedures and Operating Leverage**

Newell Brands
(NWL)



Assume Sharpie, a brand of Newell Brands, is planning to introduce a new executive pen that can be manufactured using either a capital-intensive method or a labor-intensive method. The predicted manufacturing costs for each method are as follows:

	Capital Intensive	Labor Intensive
Direct materials per unit	\$ 5.00	\$ 6.00
Direct labor per unit	\$ 5.00	\$10.00
Variable manufacturing overhead per unit	\$ 4.00	\$ 2.00
Fixed manufacturing overhead per year	\$2,440,000	\$700,000

Sharpie's market research department has recommended an introductory unit sales price of \$40. The incremental selling costs are predicted to be \$500,000 per year, plus \$2 per unit sold.

Required

- a. Determine the annual break-even point in units if Sharpie uses the:
 1. Capital-intensive manufacturing method.
 2. Labor-intensive manufacturing method.
- b. Determine the annual unit volume at which Sharpie is indifferent between the two manufacturing methods.
- c. Management wants to know more about the effect of each alternative on operating leverage.
 1. Explain operating leverage and the relationship between operating leverage and the volatility of earnings.
 2. Compute operating leverage for each alternative at a volume of 250,000 units.
 3. Which alternative has the higher operating leverage? Why?

LO3, 5**E3-22. Contribution Income Statement and Operating Leverage**

Stateline Berry Farm harvests early-season blueberries for shipment throughout Michigan and Illinois in July. The blueberry farm is maintained by a permanent staff of 10 employees and seasonal workers who pick and pack the blueberries. The blueberries are sold in crates containing 100 individually packaged one-quart containers. Affixed to each one-quart container is the distinctive Stateline Berry Farm logo inviting buyers to "Enjoy the berry best blueberries in the world!" The selling price is \$90 per crate, variable costs are \$80 per crate, and fixed costs are \$280,000 per year. In the year 2017, Stateline Berry Farm sold 50,000 crates.

Required

- a. Prepare a contribution income statement for the year ended December 31, 2017.
- b. Determine the company's 2017 operating leverage.
- c. Calculate the percentage change in profits if sales decrease by 10 percent.
- d. Management is considering the purchase of several berry-picking machines. This will increase annual fixed costs to \$375,000 and reduce variable costs to \$77.50 per crate. Calculate the effect of this acquisition on operating leverage and explain any change.

Exhibit 4.4 ■ Differential Analysis of an Outsourcing Decision with Opportunity Cost

	Cost to do Internally	Cost to Outsource	Difference (income effect of outsourcing)
Cost to outsource data storage		\$15,000	\$(15,000)
Cost to do internally			
Variable costs related to data storage ($\$0.20 \times 30,000^*$) . . .	\$ 6,000		6,000
Fixed costs related to data storage	5,000		5,000
Opportunity cost of lost subscription revenue	7,000		7,000
Total	<u>\$18,000</u>	<u>\$15,000</u>	<u>\$ 3,000</u>
Advantage of providing service internally		<u>\$3,000</u>	

*300,000 miles divided by 10

Business Insight ■ Boeing Rethinks Outsourcing

Boeing made headlines in 2007 when aggressive outsourcing led to unanticipated delays in the launch of their new flagship aircraft, the 787 Dreamliner. At the time, the company believed that the radically outsourced production process would eventually be “more efficient and profitable than existing construction methods.” However, under pressure from customers the airline has moved more and more production back in-house. In fact, upon ordering the 777x, Emirates Airline publicly asked Boeing not to outsource production of the planes to avoid the delays faced by Dreamliner customers.

Boeing’s enthusiasm for outsourcing the Dreamliner and other planes was quickly tempered as language barriers, further outsourcing by contractors, and poor communication across the production process led to issues of quality and schedule delays. Now even more production is being moved back in-house, as Boeing reconsiders the costs and benefits of outsourcing parts of its complex design, production, and manufacturing processes.

Sources: Jon Ostrower, “Boeing Insources Jumbo Work,” *The Wall Street Journal*, September 17, 2015; David Kesmodel and Daniel Michaels, “For Boeing, It’s Been a Long, Strange Trip,” *The Wall Street Journal*, September 23, 2011; and Lynn Lunsford “Boeing Scrambles to Repair Problems With New Plane,” *The Wall Street Journal*, December 7, 2007.

Even if outsourcing appears financially advantageous in the short run, management should not decide to outsource before considering a variety of qualitative risk factors. Is the outside supplier interested in developing a long-term relationship or merely attempting to use some temporarily idle capacity? If so, what will happen at the end of the contract period? What impact would a decision to outsource have on the morale of a company’s employees? Will it have to rehire laid-off employees after the contract expires? Will the outside supplier meet delivery schedules? Does the supplied part meet quality standards? Will it continue to meet them? Organizations often manufacture products or provide services they can obtain elsewhere in order to control quality, to have an assured supply source, to avoid dealing with a potential competitor, or to maintain a core competency. Some of these issues are discussed in the Business Insight that follows.

The qualitative risk factors discussed above are often magnified when a company goes global, either as an outsourcing buyer or provider. Global outsourcing is often motivated by the desire to get projects completed “on time” and “within budget.” In the following Research Insight, PricewaterhouseCoopers views outsourcing as a way to focus resources on operations that truly differentiate the firm.

Actual Income Statement For the Month of July			
Sales (11,000 bags × \$38.50)			\$423,500
Less variable costs			
Variable cost of goods sold			
Direct materials	\$108,000		
Direct labor	70,000		
Manufacturing overhead	<u>81,000</u>	\$259,000	
Selling		<u>65,000</u>	(324,000)
Contribution margin			99,500
Less fixed costs			
Manufacturing overhead		53,000	
Selling		9,500	
Administrative		<u>3,800</u>	(66,300)
Net income			<u>\$ 33,200</u>

We've assumed Tumi contains three responsibility centers: a production department, a sales department, and an administration department. Earlier in the chapter, we discussed both the production and the sales department variances. The sales department's variances in Exhibit 10.3 net to \$15,000 U and the production department's variances in Exhibit 10.1 net to \$4,000 F. Next, we assume that the administration department had a budgeted amount of \$4,000 while the actual amount spent was \$3,800. Because the administration department is a discretionary cost center, this variance of \$200 (\$3,800 actual – \$4,000 budget) is best identified as being under budget. For consistency in the performance reports, however, it is labeled favorable. By assigning all variances to these three responsibility centers, the reconciliation of budgeted and actual income is as shown in Exhibit 10B.2.

Exhibit 10B.2 ■ Reconciliation of Budgeted and Actual Income

TUMI Reconciliation of Budgeted and Actual Income For Month of July	
Budgeted net income	\$44,000
Sales department variances (Exhibit 10.3)	15,000 U
Production department variances (Exhibit 10.1)	4,000 F
Administration department variances (\$3,800 actual – \$4,000 budgeted)	<u>200 F</u>
Actual net income	<u>\$33,200</u>

Review 10-8 L08



Midstate Supply Company has three responsibility centers: sales, production, and administration. The following information pertains to the November activities of Midstate Supply:

Budgeted contribution income	\$18,000
Actual contribution income	27,000
Sales price variance	24,000 F
Sales volume variance	40,000 F
Net sales volume variance	6,000 F
Sales department variable expense variance	18,000 U
Sales department fixed expense variance	1,500 U
Administration department variances	500 F
Production department variances	2,000 U

Required

Solution on p. 396. Prepare a reconciliation of budgeted and actual contribution income.

Required

Compute the revenue, sales price, and the sales volume variances.

M10-23. Fixed Overhead Variances

Assume that **ExxonMobile** uses a standard cost system for each of its refineries. For the Houston refinery, the monthly fixed overhead budget is \$8,000,000 for a planned output of 5,000,000 barrels. For September, the actual fixed cost was \$8,750,000 for 5,100,000 barrels.

Required

- Determine the fixed overhead budget variance.
- If fixed overhead is applied on a per-barrel basis, determine the volume variance.

M10-24. Reconciling Budgeted and Actual Income

Black Supply Company has three responsibility centers: sales, production, and administration. The following information pertains to the November activities of Black Supply:

Budgeted contribution income	\$36,000
Actual contribution income	54,000
Sales price variance	48,000 F
Sales volume variance	80,000 F
Net sales volume variance	12,000 F
Sales department variable expense variance	36,000 U
Sales department fixed expense variance	3,000 U
Administration department variances	1,000 F
Production department variances	4,000 U

Required

Prepare a reconciliation of budgeted and actual contribution income.

L07

ExxonMobile (XOM)

**L08****Exercises****E10-25. Elements of a Flexible Budget**

Presented are partial flexible cost budgets for various levels of output.

		Rate per unit	Units	
		2,500	3,750	5,000
Direct materials	a.	\$25,000	b.	c.
Direct labor	d.	e.	7,500	f.
Variable overhead	\$3	g.	h.	i.
Fixed overhead		j.	k.	l.
Total		m.	n.	\$100,000

Required

Solve for items "a" through "n."

E10-26. Elements of Labor and Variable Overhead Variances

Chelsea Fabricating applies variable overhead to products on the basis of standard direct labor hours. Presented is selected information for last month when 10,000 units were produced.

L02**L04, 5**

Review 10-6—Solution

Revenue variance	=	$(AQ \times AP) - (BQ \times BP)$
	=	$(150 \times \$26) - (125 \times \$25)$
	=	<u>\$775 F</u>
Sales price variance	=	$(AP - BP) \times AQ$
	=	$(\$26 - \$25) \times 150$
	=	<u>\$150 F</u>
Sales volume variance	=	$(AQ - BQ) \times BP$
	=	$(150 - 125) \times \$25$
	=	<u>\$625 F</u>

Review 10-7—Solution

a.	Actual fixed overhead cost	\$6,250,000
	Budgeted fixed overhead cost	<u>(6,000,000)</u>
	Fixed overhead budget variance	<u>\$ 250,000 U</u>
b.	Fixed overhead rate = $\$6,000,000/2,000,000 = \$3.00/\text{barrel}$	
	Budgeted fixed overhead cost	\$6,000,000
	Applied fixed overhead (2,100,000 \times \$3.00 barrels)	<u>(6,300,000)</u>
	Volume variance	<u>\$ 300,000 F</u>

Review 10-8—Solution

MIDSTATE SUPPLY COMPANY Reconciliation of Budgeted and Actual Contribution Income For the Month of November			
Budgeted income			\$18,000
Sales department variances:			
Sales price variance	\$24,000 F		
Net sales <u>volume variance</u>	6,000 F		
Variable expenses	18,000 U		
Fixed expenses	<u>1,500 U</u>	10,500 F	
Administration department variances		500 F	
Production department variances		<u>2,000 U</u>	
Actual income			<u>\$27,000</u>

Note: The important point is to leave out the sales volume variance and to properly consider the impact of favorable and unfavorable variances on income.

where

$$\text{Investment turnover} = \frac{\text{Sales}}{\text{Investment center asset base}}$$

and

$$\text{Return-on-sales} = \frac{\text{Investment center income}}{\text{Sales}}$$

When investment turnover is multiplied by return-on-sales, the product is the same as investment center income divided by investment center asset base:

$$\text{ROI} = \frac{\text{Sales}}{\text{Investment center asset base}} \times \frac{\text{Investment center income}}{\text{Sales}} = \frac{\text{Investment center income}}{\text{Investment center asset base}}$$

Once ROI has been computed, it is compared to some previously identified performance criteria. These include the investment center's previous ROI, overall company ROI, the ROI of similar divisions, or the ROI of nonaffiliated companies that operate in similar markets. The breakdown of ROI into investment turnover and return-on-sales is useful in determining the source of variance in overall performance.

To illustrate the computation and use of ROI, suppose the following information is available concerning the 2017 operations of **Procter & Gamble Co. (P&G)** (in thousands):

Division	Asset Base	Sales	Divisional Income
Beauty	\$8,000,000	\$12,000,000	\$1,440,000
Healthcare	4,000,000	8,000,000	960,000
Grooming	7,500,000	5,000,000	1,650,000
Fabric & Homecare.	3,800,000	5,700,000	1,026,000

Using this information and the preceding equations, a set of performance measures are shown in Exhibit 11.3. To illustrate, the Beauty Division earned a return on its investment base of 18 percent (\$1,440,000 ÷ \$8,000,000), consisting of an investment turnover of 1.50 (\$12,000,000 ÷ \$8,000,000) and a return-on-sales of 0.12 (\$1,440,000 ÷ \$12,000,000). Using such an analysis, the company has three measurement criteria with which to evaluate the performance of the Beauty Division: (1) ROI, (2) investment turnover, and (3) return-on-sales.

Exhibit 11.3 ■ Performance Evaluation Data

PROCTER & GAMBLE CO. Performance Measures For Year Ending June 30, 2017			
	Performance Measures		
	Investment Turnover	× Return-on-Sales	= ROI
Operating unit			
Beauty	1.50	0.12	0.18
Healthcare	2.00	0.12	0.24
Grooming	0.67	0.33	0.22
Fabric & Homecare.	1.50	0.18	0.27
Company performance criteria			
Projected minimums	1.20	0.15	0.18

Table 12A.1 Present Value of \$1

Present value of \$1 = $\frac{1}{(1+i)^n}$													
Discount rate (i)													
Periods (n)	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%	24%	26%	28%
1	0.96154	0.94340	0.92593	0.90909	0.89286	0.87719	0.86207	0.84746	0.83333	0.81967	0.80645	0.79365	0.78125
2	0.92456	0.89000	0.85734	0.82645	0.79719	0.76947	0.74316	0.71818	0.69444	0.67186	0.65036	0.62988	0.61035
3	0.88900	0.83962	0.79383	0.75131	0.71178	0.67497	0.64066	0.60863	0.57870	0.55071	0.52449	0.49991	0.47684
4	0.85480	0.79209	0.73503	0.68301	0.63552	0.59208	0.55229	0.51579	0.48225	0.45140	0.42297	0.39675	0.37253
5	0.82193	0.74726	0.68058	0.62092	0.56743	0.51937	0.47611	0.43711	0.40188	0.37000	0.34111	0.31488	0.29104
6	0.79031	0.70496	0.63017	0.56447	0.50663	0.45559	0.41044	0.37043	0.33490	0.30328	0.27509	0.24991	0.22737
7	0.75992	0.66506	0.58349	0.51316	0.45235	0.39964	0.35383	0.31393	0.27908	0.24859	0.22184	0.19834	0.17764
8	0.73069	0.62741	0.54027	0.46651	0.40388	0.35056	0.30503	0.26604	0.23257	0.20376	0.17891	0.15741	0.13878
9	0.70259	0.59190	0.50025	0.42410	0.36061	0.30751	0.26295	0.22546	0.19381	0.16702	0.14428	0.12493	0.10842
10	0.67556	0.55839	0.46319	0.38554	0.32197	0.26974	0.22668	0.19106	0.16151	0.13690	0.11635	0.09915	0.08470
11	0.64958	0.52679	0.42888	0.35049	0.28748	0.23662	0.19542	0.16192	0.13459	0.11221	0.09383	0.07869	0.06617
12	0.62460	0.49697	0.39711	0.31863	0.25668	0.20756	0.16846	0.13722	0.11216	0.09198	0.07567	0.06245	0.05170
13	0.60057	0.46884	0.36770	0.28966	0.22917	0.18207	0.14523	0.11629	0.09346	0.07539	0.06103	0.04957	0.04039
14	0.57748	0.44230	0.34046	0.26333	0.20462	0.15971	0.12520	0.09855	0.07789	0.06180	0.04921	0.03934	0.03155
15	0.55526	0.41727	0.31524	0.23939	0.18270	0.14010	0.10793	0.08352	0.06491	0.05065	0.03969	0.03122	0.02465
16	0.53391	0.39365	0.29189	0.21763	0.16312	0.12289	0.09304	0.07078	0.05409	0.04152	0.03201	0.02478	0.01926
17	0.51337	0.37136	0.27027	0.19784	0.14564	0.10780	0.08021	0.05998	0.04507	0.03403	0.02581	0.01967	0.01505
18	0.49363	0.35034	0.25025	0.17986	0.13004	0.09456	0.06914	0.05083	0.03756	0.02789	0.02082	0.01561	0.01175
19	0.47464	0.33051	0.23171	0.16351	0.11611	0.08295	0.05961	0.04308	0.03130	0.02286	0.01679	0.01239	0.00918
20	0.45639	0.31180	0.21455	0.14864	0.10367	0.07276	0.05139	0.03651	0.02608	0.01874	0.01354	0.00983	0.00717

Table 12A.2 Present Value of an Annuity of \$1

Present value of an annuity of \$1 = $\frac{1}{i} \times 1 - \frac{1}{(1+i)^n}$													
Discount rate (i)													
Periods (n)	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%	24%	26%	28%
1	0.96154	0.94340	0.92593	0.90909	0.89286	0.87719	0.86207	0.84746	0.83333	0.81967	0.80645	0.79365	0.78125
2	1.88609	1.83339	1.78326	1.73554	1.69005	1.64666	1.60523	1.56564	1.52778	1.49153	1.45682	1.42353	1.39160
3	2.77509	2.67301	2.57710	2.48685	2.40183	2.32163	2.24589	2.17427	2.10648	2.04224	1.98130	1.92344	1.86844
4	3.62990	3.46511	3.31213	3.16987	3.03735	2.91371	2.79818	2.69006	2.58873	2.49364	2.40428	2.32019	2.24097
5	4.45182	4.21236	3.99271	3.79079	3.60478	3.43308	3.27429	3.12717	2.99061	2.86364	2.74538	2.63507	2.53201
6	5.24214	4.91732	4.62288	4.35526	4.11141	3.88867	3.68474	3.49760	3.32551	3.16692	3.02047	2.88498	2.75938
7	6.00205	5.58238	5.20637	4.86842	4.56376	4.28830	4.03857	3.81153	3.60459	3.41551	3.24232	3.08331	2.93702
8	6.73274	6.20979	5.74664	5.33493	4.96764	4.63886	4.34359	4.07757	3.83716	3.61927	3.42122	3.24073	3.07579
9	7.43533	6.80169	6.24689	5.75902	5.32825	4.94637	4.60654	4.30302	4.03097	3.78628	3.56550	3.36566	3.18421
10	8.11090	7.36009	6.71008	6.14457	5.65022	5.21612	4.83323	4.49409	4.19247	3.92318	3.68186	3.46481	3.26892
11	8.76048	7.88687	7.13896	6.49506	5.93770	5.45273	5.02864	4.65601	4.32706	4.03540	3.77569	3.54350	3.33509
12	9.38507	8.38384	7.53608	6.81369	6.19437	5.66029	5.19711	4.79322	4.43922	4.12737	3.85136	3.60595	3.38679
13	9.98565	8.85268	7.90378	7.10336	6.42355	5.84236	5.34233	4.90951	4.53268	4.20277	3.91239	3.65552	3.42718
14	10.56312	9.29498	8.24424	7.36669	6.62817	6.00207	5.46753	5.00806	4.61057	4.26456	3.96160	3.69485	3.45873
15	11.11839	9.71225	8.55948	7.60608	6.81086	6.14217	5.57546	5.09158	4.67547	4.31522	4.00129	3.72607	3.48339
16	11.65230	10.10590	8.85137	7.82371	6.97399	6.26506	5.66850	5.16235	4.72956	4.35673	4.03330	3.75085	3.50265
17	12.16567	10.47726	9.12164	8.02155	7.11963	6.37286	5.74870	5.22233	4.77463	4.39077	4.05911	3.77052	3.51769
18	12.65930	10.82760	9.37189	8.20141	7.24967	6.46742	5.81785	5.27316	4.81219	4.41866	4.07993	3.78613	3.52945
19	13.13394	11.15812	9.60360	8.36492	7.36578	6.55037	5.87746	5.31624	4.84350	4.44152	4.09672	3.79851	3.53863
20	13.59033	11.46992	9.81815	8.51356	7.46944	6.62313	5.92884	5.35275	4.86958	4.46027	4.11026	3.80834	3.54580

Required

- Using a discount rate of 10 percent, determine the net present value of the investment proposal.
- Determine the proposal's internal rate of return. (Refer to Appendix 12B if you use the table approach.)

E12-21. NPV and IRR: Unequal Annual Net Cash Inflows**LO2, 8**

Rocky Road Company is evaluating a capital expenditure proposal that has the following predicted cash flows:

Initial investment.	\$(90,220)
Operation	
Year 1	41,275
Year 2	60,000
Year 3	20,000
Salvage.	0

**Required**

- Using a discount rate of 14 percent, determine the net present value of the investment proposal.
- Determine the proposal's internal rate of return. (Refer to Appendix 12B if you use the table approach.)

E12-22. Payback Period, IRR, and Minimum Cash Flows**LO2, 3, 8**

The management of Mohawk Limited is currently evaluating the following investment proposal:

	Time 0	Year 1	Year 2	Year 3	Year 4
Initial investment.	\$150,000	—	—	—	—
Net operating cash inflows. . .	—	\$50,000	\$50,000	\$50,000	\$50,000

**Required**

- Determine the proposal's payback period.
- Determine the proposal's internal rate of return. (Refer to Appendix 12B if you use the table approach.)
- Given the amount of the initial investment, determine the minimum annual net cash inflows required to obtain an internal rate of return of 16 percent. Round the answer to the nearest dollar.

E12-23. Time-Adjusted Cost-Volume-Profit Analysis**LO2, 3**

Honeydukes Treat Shop is considering the desirability of producing a new chocolate candy called Pleasure Bombs. Before purchasing the new equipment required to manufacture Pleasure Bombs, Neville Long, the shop's proprietor performed the following analysis:

Unit selling price.	\$2.18
Variable manufacturing and selling costs.	(1.73)
Unit contribution margin.	<u>\$0.45</u>
Annual fixed costs	
Depreciation (straight-line for 4 years)	<u>\$22,500</u>
Other (all cash)	<u>45,000</u>
Total	<u>\$67,500</u>
Annual break-even sales volume = \$67,500 ÷ \$0.45 = 150,000 units	

Because the expected annual sales volume is 160,000 units, Long decided to undertake the production of Pleasure Bombs. This required an immediate investment of \$87,000 in equipment that has a life of four years and no salvage value. After four years, the production of Pleasure Bombs will be discontinued.

Required

- Evaluate the analysis performed by Long.
- If Honeydukes Treat Shop has a time value of money of 8 percent, should it make the investment with projected annual sales of 160,000 units?
- Considering the time value of money, what annual unit sales volume is required to break even?