Chapter 6
Cost-Volume-Profit (CVP) Analysis
Part I – Single Product Case

The Cost-Volume-Profit (CVP) analysis is the process of developing a mathematical model that helps management to examine the relationship between the firm ***cost structure*** (i.e., relative proportion of ***variable*** vs. ***fixed*** costs) and ***sales volume*** in order to predict the impact of changes in this relationship on the firm future ***profitability***.

The primary objective of the CVP analysis is to provide the firm manager with the answer to the following two questions:

1. How many **units** of product that the company should be produce & sell in order to break-even or to achieve its planned target profit?
2. How much the ***Sales*** **(in dollar)** that the company should generate in order to break-even or to achieve its planned target profit?

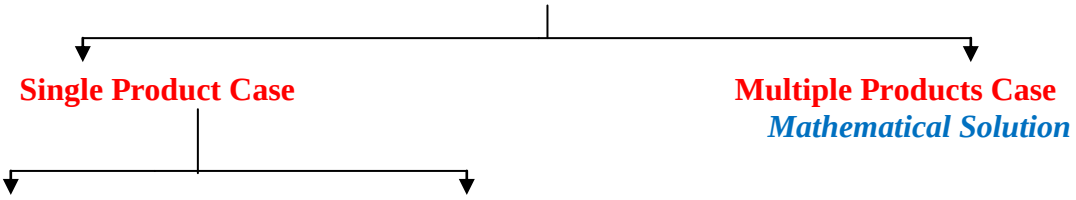
- Note that the minimum target income for any manager is to ***break-even***. The break-even point is the volume of activity where the organization's revenues and expenses are equal. At this amount of sales, the organization has no profit or loss; it *breaks even.*

In addition to answering the above two questions, the CVP analysis allows managers to perform "***sensitivity analysis***" to examine the impact of changes in selling price, cost structure (variable & fixed), and/or sales volume on the firm profitability and the breakeven point. Following are some examples of the applications of CVP analysis.

- What will happen to profit if we change the selling price, variable cost and/or fixed costs?
- Should the company buy or lease a new machine?

Figure 1 outlines the topics we cover in this chapter:

Figure 1
CVP Analysis



- Sensitivity Analysis
- Margin of Safety
- Operating Leverage
- Effect of Income Tax

The Basics of CVP Analysis

The Underlying Assumptions of the Basic CVP Model:

CVP analysis is based on the following assumptions:

1. The behavior of the cost function and the revenues function are ***linear*** within the relevant range of activity. This behavior implies that the price per unit, the variable cost per unit and the total fixed costs will not change as sales volume varies within the relevant range.
2. The selling prices, total fixed costs, and unit variable costs are known with certainty in advance and will remain unchanged during the period.
3. The number of units produced equals the number of units sold. This suggests that there no changes in the level of inventory during the period.
4. Efficiency and productivity of workers is constant.
5. When a company sells more than one type of product, the product mix (the ratio of each product to total sales) will remain constant.

The Concept of Contribution Margin (CM):

- Contribution margin is the amount remaining from sales revenue after variable expenses have been deducted. This amount contributes towards covering fixed costs and then towards making profit.
- It is important to note that the CVP analysis is performed at the ***firm wide level***.

How to Calculation of Contribution margin:

Contribution margin can be expressed three ways: in total, on a per unit basis, and as a percentage of revenues.

Unit CM = Unit SP – Unit VC
Total CM = Total Sales Revenues – Total Variable costs
Total CM = Unit CM x Quantity sold
CM% = Unit CM/Unit SP
CM% = Total CM/ Total Sales Revenues

VC% = Unit VC/Unit SP
VC% = Total VC/ Total Sales Revenues

Note the following:

- The unit CM refers to the contribution that each unit of sales makes toward covering fixed costs and earning a profit.
- The CM% refers to the contribution that each dollar of sales makes toward covering fixed costs and earning a profit.
- **CM% + VC% = 100%**

1.0 Mathematical Solution

Basic Definitions:

Let:

X(units) = the number of units that should be produced and sold to achieve the desired level of profit
X($) = the total sales revenues that should be generated to achieve the desired level of profit
NI = the desired (target) level of profit
SP = selling price per unit
VC = variable cost per unit
VC% = VC per unit (or total VC) / SP per unit (total revenues)
NI = Operating Income = Net Income before Tax

Income Statement

Total Revenues (**TR**)	(**X**(units) × SP/unit)	$xx
- Total Variable costs (**TVC**)	(**X**(units) × VC/unit)	(VC% x $xx)
Total CM	(**X**(units) ×CM/unit)	**$xxx**
- Total Fixed costs (**FC**)		($xx)
Operating Income (**NI**)		$

Net Income = Total Revenue – Total Variable Cost – Total Fixed Cost

NI = TR – TVC – FC

= (X_{Units} x SP) – (X_{Units} x VC) – FC

NI = X_{Units} (SP-VC) – FC

X_{Units} (SP-VC)= FC +NI

$$X_{Units} = \frac{FC + NI}{(SP\text{-}VC)} = \frac{FC + NI}{CM/unit}$$

$$\textbf{X(Units)} = \frac{\text{Fixed expenses} + \text{Target profits}}{\text{Unit contribution margin}} \quad \textbf{(1)}$$

- Similarly, the basic equation can also be expressed in terms of ***sales dollars*** using the variable expense ratio to drive the formula for the dollar Sales needed to achieve target income as follows:

Net Income = Total Revenues – Total VC – Total FC

Net Income = X($) – (VC% × X($)) – Total FC

(1 – VC%) × X($) = Total FC + Net Income

CM% × X($) = Total FC + Net Income

$$X(\$) = \frac{FC + NI}{CM\%} \quad \textbf{(2)}$$

Example 1.1:

David Martin graduated from the Business Scholl and decided to open a Pizza store that sells only one size pizza at ***$8.00 per unit.*** Following is a summary of various costs:

Variable Costs per Pizza

Manufacturing:		
Direct materials (flour		$ 1.50
Direct labor	0.75	
Manufacturing overhead	0.25	$2.50
S & A Expenses (delivery)		0.50
Total VC per unit		**$3.00**

Fixed Costs **per Month**

Manufacturing overhead	$ 5,000
Selling and administrative	10,000
Total FC	**$15,000**

Required:

1. How many ***Pizza X(units)***that David should sell every month to ***breakeven?***

$$\textbf{X(Units)} = \frac{\text{Fixed expenses} + \text{Target profits}}{\text{Unit contribution margin}}$$

2. How many ***Pizza X(units)*** that David should sell every month to earn a ***target NI of $9000,?***

$$\textbf{X(Units)} = \frac{\text{Fixed expenses} + \text{Target profits}}{\text{Unit contribution margin}}$$

3. What is the total ***revenue X($)*** that David should generate every month to ***breakeven?***

$$\text{X(\$)} = \frac{\text{FC} + \text{NI}}{\text{CM\%}}$$

4. What is the total ***revenue X($)*** that David should generate every month to earn ***NI of $9000,?***

$$\textbf{X(\$)} = \frac{\text{FC} + \text{NI}}{\text{CM\%}}$$

Income Statement for the Pizza Store
Under Different Sales Volume Scenarios

	Loss Domain			BEP	Profit Domain			
# of units Sold	**0**	**1**	**2999**	**3,000**	**3,001**	**3,002**	**4,000**	**4,800**
Sales Revenues	0	8	23992	**24000**	24008	24016	32000	38400
- Variable Costs	0	3	8997	**9000**	9003	9006	12000	14400
Contribution Margin	0	5	14995	**15000**	15005	15010	20000	24000
- Fixed Costs	15,000	15,000	15,000	**15,000**	15,000	15,000	15,000	15,000
Operating Income	**-15,000**	**-14,995**	**-5**	**0**	**5**	**10**	**5,000**	**9,000**

Some Important Conclusions:

- Total Contribution margin is the amount of profit available to absorb fixed costs and then contribute to the operating income.
- Each unit **above** the BEP increases the **Operating Income** by an amount equals to CM per unit.
  Hence: Total operating income = CM per unit x # of units sold ***above*** the breakeven point.
- Each unit **below** the BEP increases the **Net Loss** by an amount equals to the CM per unit.
  Hence: Net Loss = CM per unit x # of units shortage (unsold) ***below*** the breakeven point.
- Net loss is the amount of **fixed cost** that the company failed to recover from the Contribution Margin.
- Total CM = Total fixed costs + Operating Income

Example1. 2:

Steve Bendo owns an auto repair service station in Hamilton. Steve is considering leasing a machine that will allow him to provide his customers with the mandatory Ontario emissions test. The machine costs $6,000 per month to lease. The variable cost per test (i.e., per car inspected) is $10. The amount that Steve can charge each customer is set by the Province law, and is currently $40.

Required:

How many inspections would Steve have to perform monthly to generate a profit of $3,000?

MC Questions:

1. At a break-even point of 800 units sold, White Corporation's variable expenses are $8,000 and its fixed expenses are $4,000. What will the Corporation's net operating income be at a volume of 801 units?
   A. $15
   B. $10
   C. $5
   D. $20

2. Solen Corporation's break-even-point in sales is $900,000, and its variable expenses are 75% of sales. If the company lost $32,000 last year, sales must have amounted to:
   A. $868,000
   B. $804,000
   C. $772,000
   D. $628,000

3. Nantucket Company has the following cost-volume-profit (CVP) relationships:

Breakeven point in units sold	2,000
Sales price per unit	$ 625
Total fixed costs	$125,000

   What is the variable cost per unit?
   A) $515.00
   B) $562.50
   C) $625.00
   D) $655.25

4. AAA Company produced a product which had a selling price of $20 and a variable cost which amounted to 60% of sales. Given a fixed cost of $60,000, the breakeven sales will be
   a. 5,000 units
   b. 5,500 units
   c. 6,000 units
   d. 7,000 units
   e. 7,500 units

5. AAA Company produced a product which had a selling price of $20 and a variable cost which amounted to 40% of sales. The fixed costs amount to $60,000. How many units AAA must sell to earn $15,000?
   a. 6,250 units
   b. 7,396 units
   c. 9,375 units
   d. 9,844 units

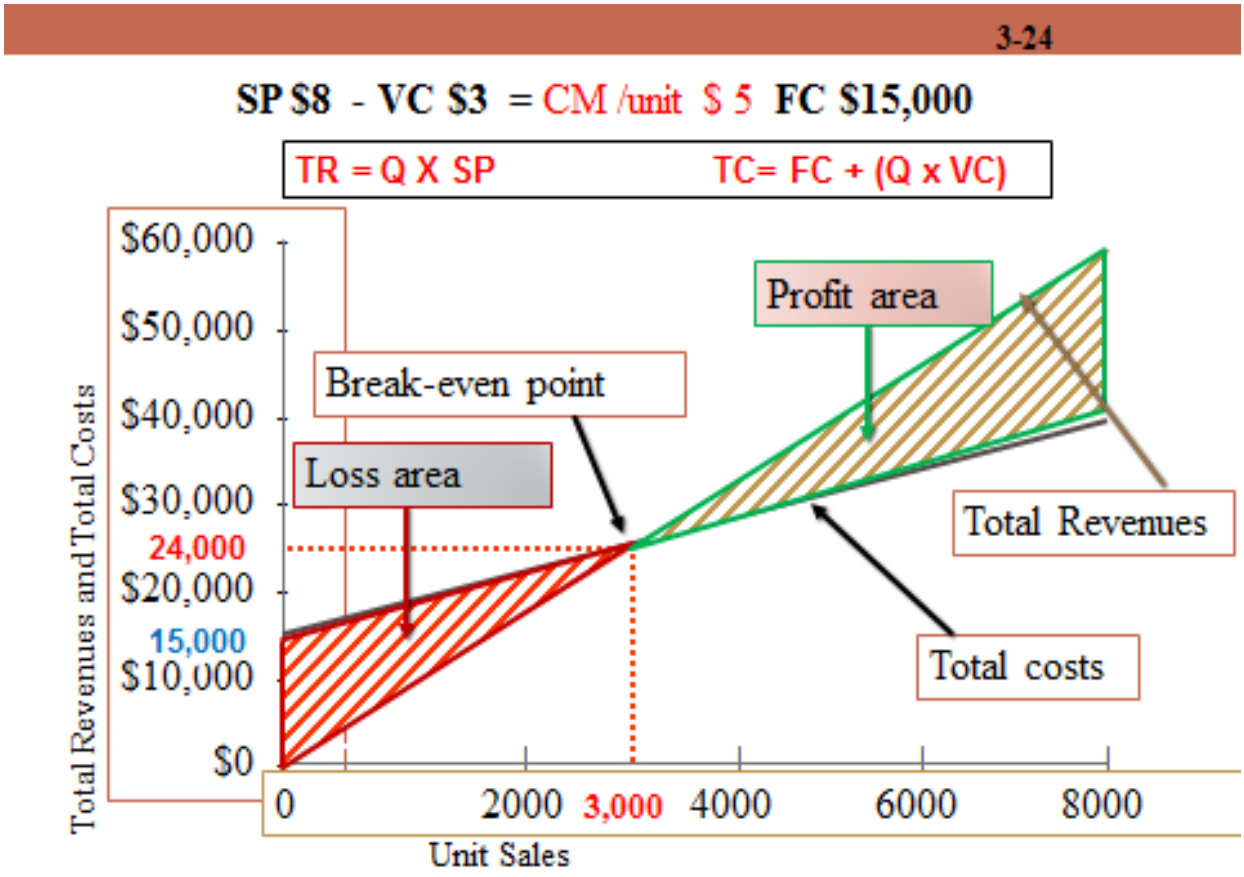
Question	1	2	3	4	5
Answer	c	c	b	e	a

2.0 Graphical Solution

- The CVP graph is drawn with dollars on the vertical axis and volume in units on the horizontal axis.
- Total revenue line is drawn by plotting two data points of the revenue function: TR = Q x SP/unit.
- Total cost line is drawn next by plotting two data points of the cost function: TC = FC + (Q x VC/unit). Total fixed expense is drawn first, and then variable expense is added to the fixed expense in order to draw the total expense line.
- The point where the total revenue line and the total cost line intersect is the break-even point.
- The total profit (or loss) is the vertical difference between the total revenue and total expense lines.
- The following graph depicts the relationships among cost, volume, and profits.

Example 2.1

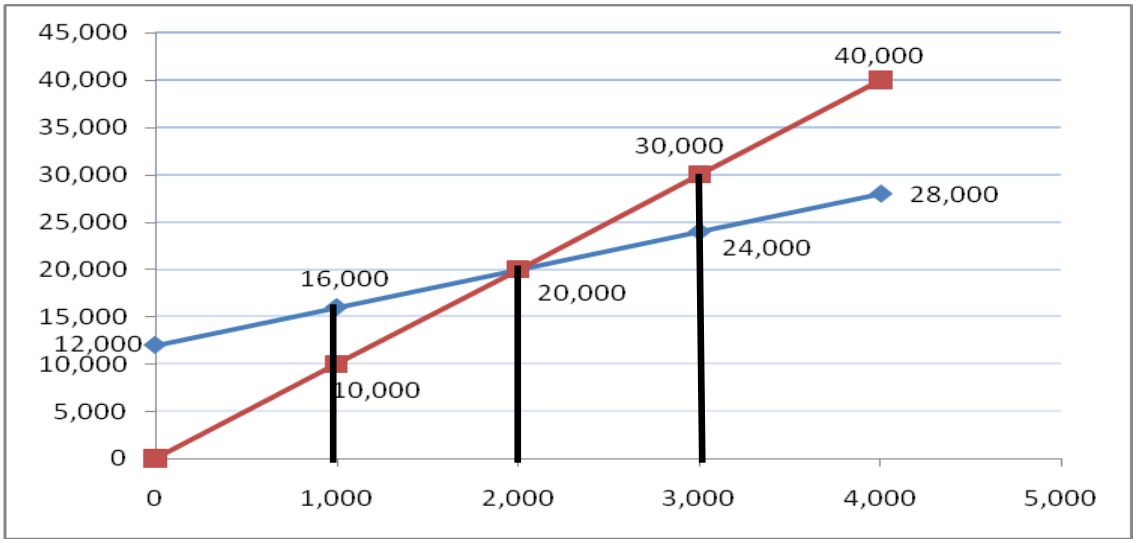
Graphical Solution for Example 1.1: (David Martin's Pizza Store)



Example 2.2:

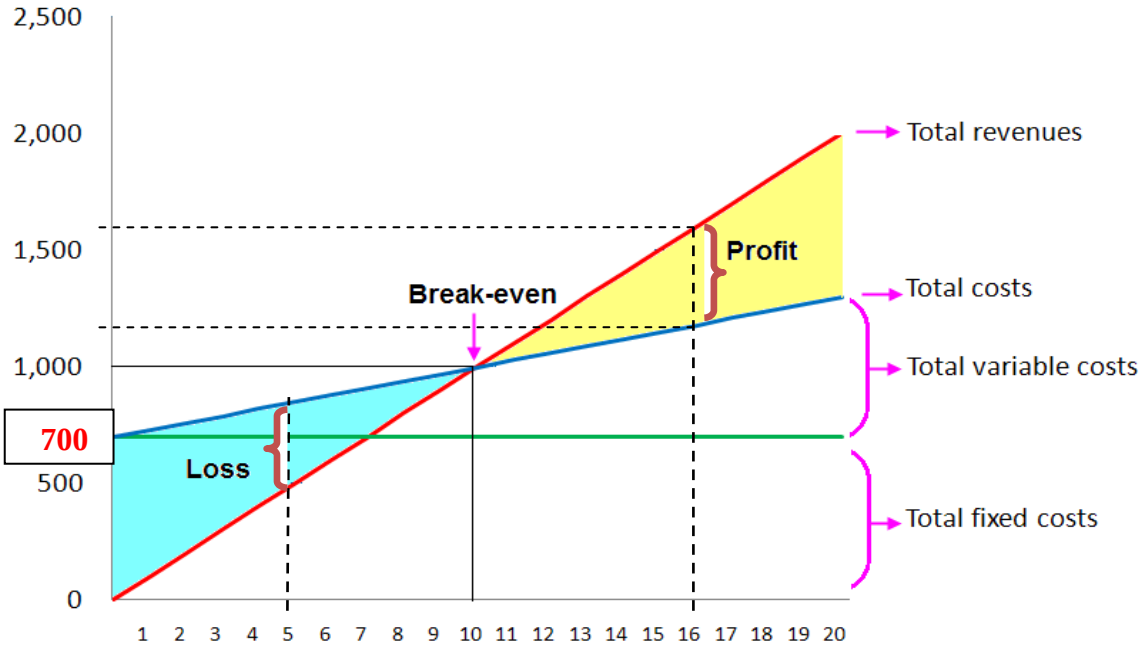
Use the next graph to answer the following questions:

1. Calculate the SP per unit, VC per Unit, and CM per Unit.
2. How much the NI (loss) if the company sold 900 units.
3. How much the NI (loss) if the company sold 3,500 units.



Example 2.3:

Use the next graph to find the operating income at **16** units and at **5** units of production



Example 2.4

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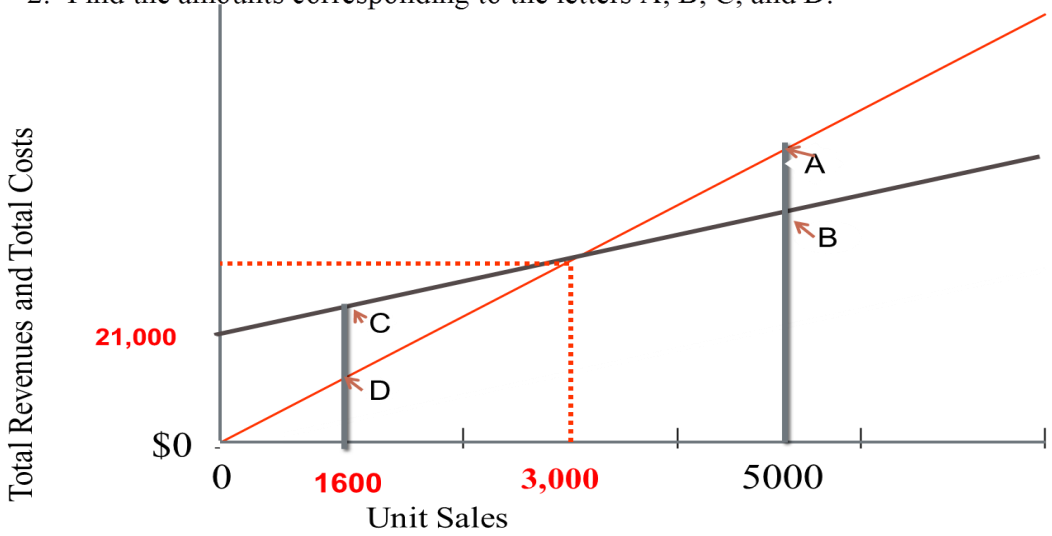
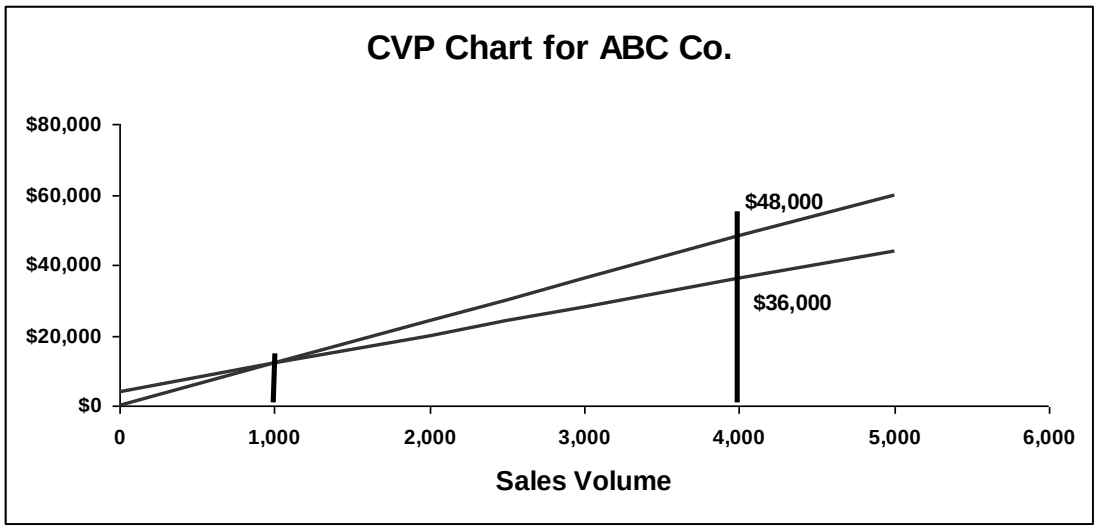
Use the following graph to answer the next questions, given that CM% = 0.7

1. Calculate BEP ($), CM per unit, VC per unit, NI at 5000 units and at 1600 units.
2. Find the amounts corresponding to the letters A, B, C, and D.



Example 2.5:

Use the following graph to calculate the **Fixed Cost** and the operating income at **3,000** units.



3.0 Sensitivity (What-if) Analysis

In addition to help manager to identify the sales volume (in units or dollars) needed to breakeven or to achieve a target operating income, the CVP analysis also helps firm managers to make more complex decisions related to the questions of "What If" one or more of the factors in the CVP model are expected to change. This analysis is referred to as "Sensitivity Analysis".

Sensitivity analysis is the process of examining how the profit of the company will change in response to projected changes in one or more of the basic factors in the CVP model (i.e., selling price, variable cost per unit, fixed costs, or the target volume).

To perform sensitivity analysis, we simply replace components of the CVP equation to reflect new changes in selling price, fixed costs, variable costs, and/or desired profit level.

Some Basic Remarks & General Conclusions on "What If" Analysis:

Let's examine the impact of changes in some variables on the **Breakeven Analysis**, by first allowing only one variable to change at a time, and then allow several variables to simultaneously change:

$$X(Units) = \frac{FC + 0}{(SP - VC)}$$

- An *increase* in fixed costs will *increase* the breakeven point by the *same ratio*; and vice versa.
- An *increase* in the variable cost per unit will *decrease* the contribution margin per unit and hence *increase* the break-even point; and vice versa.
- An *increase* in the sales price per unit will *increase* the contribution margin per unit, and hence *decrease* the break-even point; and vice versa.
- If the fixed costs, selling price per unit and variable cost per unit are all ***changed*** by the *same percentage* in the *same direction*, then the break-even point will remain unchanged.
- If the unit sales price and unit variable cost each increased by the **same dollar amount**, then the unit contribution margin remains unchanged and, thus, the breakeven point will not change.
- If the unit sales price and unit variable cost both increased by the **same percentage** (e.g., 20%), the unit contribution margin will increase. An increase in the unit contribution margin causes the break-even point to decline**.**

  To illustrate this point, assume that the SP=$10, VC=$8 and, Hence, the CM = $2.00/unit. Assume further that the SP and VC each increased by 20%. Thus, the new SP = $12, the new VC = $9.60, and the New CM = $2.40.

Example 3.1:

Garth Corporation sells a single product. If the selling price per unit and the variable expense per unit both increase by 10% and fixed expenses do not change, then:

	Contribution margin per unit	Contribution margin ratio	Break-even in units
A)	Increases	Increases	Decreases
B)	No change	No change	No change
C)	No change	Increases	No change
D)	Increases	No change	Decreases

Example 2:

Alice Waters (age 9) runs a lemonade stand during the summer. Her daily fixed costs are $20. Her variable costs are $2 per glass of ice-cold, refreshing, lemonade. Alice sells an average of 100 glasses per day.

Required:

1. What price would Alice have to charge per glass, in order to generate profit of $20 per day?

$$\boldsymbol{X(Units)} = \frac{FC + NI}{(SP - VC)}$$

$$\mathbf{100} = \frac{20 + 20}{(SP - 2)} = \mathbf{\$2.4}$$

2. Assume that Alice wants to upgrade the quality of the input by including only organic ingredients. This will increases variable cost to $2.50 per glass. Alice expects that the new proposal will increase the daily sales to 120 glasses.
   What price would Alice have to charge per glass, in order to generate profit of $40 per day?

$$\mathbf{120} = \frac{20 + 40}{(SP - 2.\mathbf{5})} = \mathbf{\$2.9}$$

Example 3:

The Beta Mu Omega Chi (BMOC) fraternity is looking to contract with a local band to perform at its annual mixer. BMOC expects to sell 250 tickets to the mixer at $10 each.

Which of the following arrangements with the band will be in the best interest of the fraternity?

Option 1: $2500 fixed fee.
Option 2: $1000 fixed fee plus $4 per person attending.
Option 3: $7 per person attending.

Option 1: $250 = \frac{\$2,500 + \mathbf{NI}}{(10 - 0)} = 0$

Option 2: $250 = \frac{\$1,000 + \mathbf{NI}}{(10 - 4)} = \$500$

Option 2: $250 = \frac{\$0 + \mathbf{NI}}{(10 - 7)} = \$750$

Therefore, Option 3 is the best choice.

Example 4:

AAA currently has a profit of $15,000 at a sales volume of 6250 units and a variable cost of $8 and a selling price of $20. If variable costs increase to $9, by how much can the fixed costs change to still maintain the same profit?

Current Fixed Costs:

$$X(Units) = \frac{FC + NI}{(SP - VC)}$$

Example 5:

Karen Hefner, a florist, operates retail stores in several shopping malls. The average selling price of an arrangement is $30 and the average variable cost of each sale is $18.
A new mall is opening where Karen wants to locate a store, but the location manager is not sure about the rent method to accept. The mall operator offers the following three options for its retail store rentals:

1. Paying a fixed rent of $15,000 a month, or
2. Paying a base rent of $9,000 plus 10% of revenue received, or
3. Paying a base rent of $4,800 plus 20% of revenue received up to a maximum rent of $25,000.

Required:
For each option, compute the break-even sales and the Total Monthly rent paid at break-even.

Example 6:
Elmo Co. recently sold 7,000 units, generating sales revenue of $490,000. The company's Variable cost per unit and total fixed cost amounted to $20 and $280,000, respectively.
Required:

1. What is the current breakeven point in units and the current operating income?

2. The company anticipates a $2 hike in the variable cost per unit. If all other costs remain constant and management desires to maintain the firm's current break-even point and the

4.0 Margin of Safety

- The **margin of safety** is a measure of risk that indicates how much *sales* can drop before a loss will occur. It is often viewed as "Cushion of Loss". The larger the margin of safety, the safer the situation is since there is less risk of reaching the break-even point.
- The margin of safety can be computed in four different ways:

Margin of safety (in units) = Expected (or actual) sales (in units) – Sales at break-even (in units)

Margin of safety in ($) = Expected (or actual) sales (in dollar) – Sales at break-even (in dollar)

Margin of safety ratio (using $) $= \dfrac{\text{Margin of safety in dollars}}{\text{Total Budgeted (Actual) sales}}$

Margin of safety ratio (using units) $= \dfrac{\text{Margin of safety in units}}{\text{Total Budgeted (Actual) sales in units}}$

- The margin of safety ratio is a useful measure of comparing the relative risk among alternative products or for assessing the riskiness in any given product. A relatively low margin of safety ratio for a product is usually an indication that the product is riskier than higher margin of safety products.

Example4.1: Using Data from Example 1.1 (David Martin Pizza Example)

SP =8; VC = 3 CM(unit) = $5; FC = $15,000

BEP = 3000 (units) & ($24,000);

Budgeted Sales = 5000 units & ($40,000)

Margin of safety (**in units**) = Expected sales (units) –break-even (units)

= 5000 – 3000 = 2000 units

Margin of safety **($)** = Expected sales ($) – Sales at break-even ($)

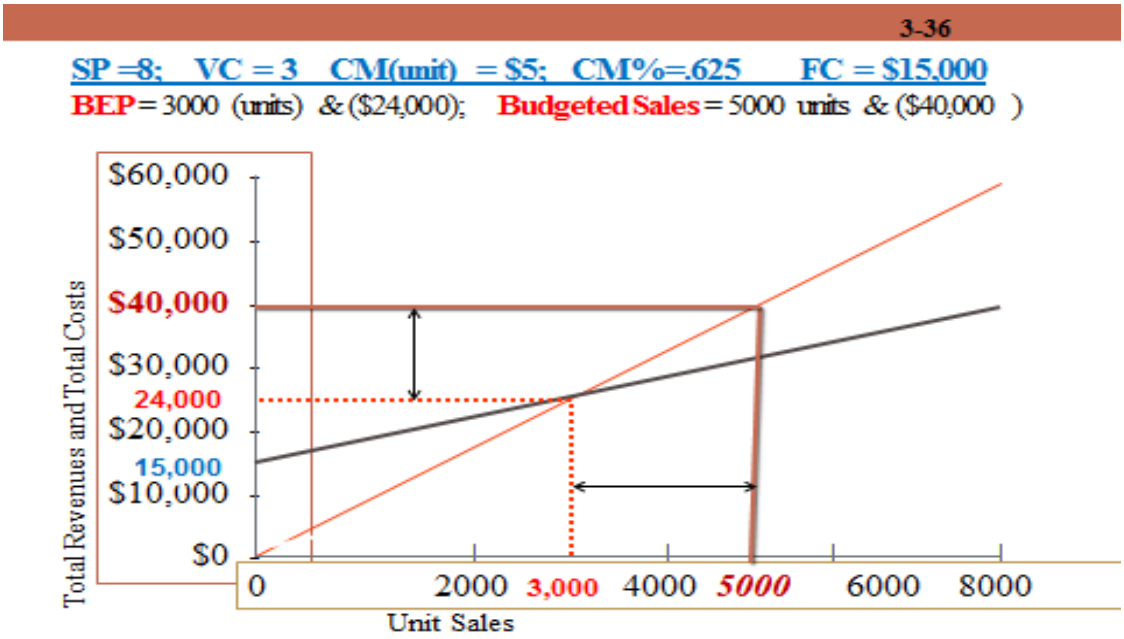
= $40,000 – 24,000 = $16,000

Margin of safety Ratio = Margin of Safety in **($)** / Expected Sales in **($)**

= *$16,000/ $40,000* = *40%*

Margin of safety Ratio = Margin of Safety in (**Units**) / Expected Sales in (**Units**)

= *2000 units / 5000 units* = *40%*



Example 4.2:

Assume that ABC Co. sells a product for $10 each, has a unit variable cost of $4, total monthly fixed costs of $15,600, and is selling an average of 2,850 units each month. Calculate the margin of safety in units and in dollars.

The breakeven point in units previously calculated was 2,600 units.

The margin of safety in units for ABC is:

Margin of safety in units = 2,850 - 2,600 = 250 units
Sales in units can drop by 250 units before the company is 'in trouble', i.e., before it incurs a loss.

The margin of safety in sales dollars is:

Margin of safety in sales dollars = (2,850 x $10) - (2,600 x $10) = $2,500

Sales revenue can drop by $2,500 before the company incurs a loss.

Example 4.3:

Arthur Corporation has a margin of safety percentage of 25% based on its actual sales. The break-even point is $300,000 and the variable expenses are 45% of sales. Given this information, the actual profit is:

A. $75,000
B. $55,000
C. $15,000
D. $41,250

B

5.0 Operating Leverage

- Operating Leverage measures the ***risk-return*** tradeoff across alternative cost structures.
- Cost structure refers to the relative proportion of fixed and variable costs in an organization.
- Operating leverage is a measure of how sensitive net income is to a given percentage change in sales volume.
- Understanding a company's cost structure is important for decision making. This insight may lead managers to consider alternative cost structures.

  For example, compensating salespersons on the basis of sales commission (variable costs) rather than salary (fixed cost) decreases the company's downside risk if demand is low but decreases its return if demand is high.

  On the other hand, paying salesperson fixed salary would result in increasing the fixed cost and decreasing the variable cost component, yielding a larger contribution margin and the possibility of larger profit. In this case, once the fixed costs are recovered, the contribution margin is profit.

To illustrate this point, consider the impact of the two options for paying sales persons on the income statement:

Income Statement

Total Revenues	**TR**
- Total Variable costs	(**TVC**)
Total CM	**CM**
- Total Fixed costs	(**FC**)
Operating Income	**NI**

- Thus, a company with high operating leverage would have high FC, low VC, and high CM. Such a company would experience a large change in operating income for a small change in sales, as compared with a company which have low operating leverage.

Measuring Operating Leverage

A company's degree of operating leverage (DOL) is calculated by dividing the amount of contribution margin by the amount of operating income.

$$\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Operating income}}$$

Interpreting the Degree of Operating Leverage

A company with higher DOL has more extreme fluctuations in operating income than a company with a lower DOL when a change in sales revenue occurs. A high DOL implies a more risky operating structure because of the volatility of the change in profit. Conversely, a lower DOL amount implies a less risky operating structure.

Example 5.1:
Suppose Alex Company has a contribution margin of $495,000 and operating income of $110,000. Its DOL is $495,000 divided by $110,000, or 4.50.

- The DOL of 4.50 indicates that each dollar increase in sales revenue is expected to generate a $4.50 increase in profit.
- Conversely, for every $1 decrease in sales revenue, the company will experience a $4.50 decrease in operating income.

Using the Degree of Operating Leverage to Predict Operating Income

The DOL can be used to predict the effect that a specified change in sales will have on operating income. Thus, the manager can quickly calculate the percentage change in operating income by multiplying the DOL by the anticipated percentage change in sales, using the following equation:

Percentage change in profit = DOL × % change in sales

Assuming that Alex Company's sales are expected to increase by 10 percent, the expected change in operating income is:

Percentage increase in operating income = 4.50 x 10% = 45%

To determine the dollar ***change*** in profit, multiply the percentage change in operating income times the original profit of $110,000:

Dollar change in operating income = 45% x $110,000 = $49,500

Operating income is expected to increase by $49,500 if sales increase by 10%. To determine the estimated new profit level as a result of the change, add the original profit to the increase.

Estimated new operating income level = $49,500 + $110,000 = $159,500

Example 5.2:

The following data are related to two identical companies with different cost structure:

	Comp A	Comp B
Sales	300,000	300,000
Variable cost	255,000	120,000
CM	45,000	180,000
Fixed cost	15,000	150,000
Operating income	30,000	30,000

Both companies sell same product at same price. While Company A is more labor intensive, Company B is more capital intensive.

Required:

1. Calculate the BEP in dollar for both companies.

2. Calculate the degree of operating leverage for both companies.

3. What effect will a 20% increase in sales have on both companies' operating income?

6.0 THE EFFECT OF INCOME TAX

- Organizations making profit must pay income taxes. A business only gets to keep income after taxes
- The target net income figure discussed included in equations (1) and (2) is implicitly stated in terms of net income before-tax (i.e., operating income).
- If the target net income, however, is stated in terms of the bottom line (i.e., net income after-tax), a minor adjustment should be made by converting the target income after-tax income to a net income before-tax figure as follows:

$$\text{NI Before-Tax} = \frac{\text{NI After-Tax}}{(1 - \text{Tax Rate})}$$

Note the following:

1. To incorporate income tax into the analysis, the income tax rate has to be explicitly stated in the problem, otherwise we ignore income tax effects.
2. A change in the tax rate will have no effect on the firm's break-even point. At the break-even point, the firm has no profit and does not have to pay any income taxes.

Example 6.1:

Brian O'Neil intends to sell his customers a special round-trip airline ticket package. He is able to purchase the package from the airline carrier for $400 each. The airline intends to reimburse Brian for any unsold ticket packages. The round-trip tickets will be sold for $500 each. Brian has a tax rate of 30% on his business income.

Required:

What is the dollar sales required for Brian to earn an after-tax profit of $7,000 if fixed costs are $10,000.

NI Before Tax = 7000/ (1 - 0.3) = $10,000
CM% = (500 - 400) / 500 = 0.20

$$X(\$) = \frac{FC + NI}{CM\%}$$

$$X(\$) = \frac{10{,}000 + 10{,}000}{20\%} = \mathbf{\$100{,}000}$$

MC Questions:

Answer the following two question(s) using the information below.

Stephanie's Bridal Shoppe sells wedding dresses. The average selling price of each dress is $1,000, variable costs are $400, and fixed costs are $90,000.

1. What is the Bridal Shoppe's operating income when 200 dresses are sold?
   A) $120,000
   B) $80,000
   C) $200,000
   D) $100,000
   E) $30,000

2. How many dresses must be sold to earn after-tax net income of $18,000, assuming the tax rate is 40%?
   A) 180 dresses
   B) 170 dresses
   C) 150 dresses
   D) 200 dresses
   E) 270 dresses

Use the following data to answer the next two questions:

Kelvin Co. produces and sells socks. Variable costs are $4 per pair, and fixed costs for the year total $90,000. The selling price is $6 per pair.

3. Calculate the sales units required to make an after-tax profit of $15,000, given an income tax rate of 40%.
   A) 56,000 units.
   B) 56,500 units.
   C) 57,000 units.
   D) 60,000 units.
   E) 57,500 units.

4. Calculate the sales dollars required to make an after-tax profit of $15,000, given an income tax rate of 40%.
   A) $336,000.
   B) $339,000.
   C) $342,000.
   D) $360,000.
   E) $345,000.

5. Barrey, Inc. is subject to a 40% income tax rate. The following data pertain to the period just ended when the company produced and sold 45,000 units:

Sales revenue	$1,350,000
Variable costs	810,000
Fixed costs	432,000

How many units must Barrey sell to earn an after-tax profit of $180,000?
A. 42,000.
B. 45,000.
C. 51,000.
D. 61,000.

Question	1	2	3	4	5
Answer	E	D	E	E	D