# Managerial Accounting

Introduction : Managerial Accounting Concepts and Principles Dr. Hussein Al-Shammari

# What Is Managerial Accounting?

Managerial Accounting: – measures, analyses • and reports financial and nonfinancial information to help managers make decisions to fulfill organizational goals..

المحاسبة الإدارية :- القياس والتحليل والتقرير عن
 المعلومات المالية وغير المالية التي تساعد المديرين على
 اتخاذ القرارات لتحقيق الأهداف التنظيمية .

# **Functions of Managerial Accounting**

#### Exhibit 3

#### The Management Process



# Major Differences Between Financial & Managerial Accounting

	Managerial Accounting	Financial Accounting
Purpose	Decision making	Communicate financial position to outsiders
Primary Users	Internal managers	External users
Focus/Emphasis	Future-oriented	Past-oriented
Rules	Do not have to follow GAAP; cost vs. benefit	GAAP compliant; CPA audited
Time Span	Ultra current to very long time horizons	Historical monthly, quarterly reports
Information type	Economic and physical data as well as financial data	Financial data

### What Do We Mean By a Cost?

A cost is the measure of resources given up to achieve a particular purpose.

#### Product Costs, Period Costs, and Expenses

Product costs are costs assigned to inventory, to goods that are either purchased or manufactured for resale. Another term for product cost is inventoriable cost.

Period costs are costs that are expensed during the time period in which they are incurred.

Expenses are the consumption of assets for the purpose of generating revenue.

- Direct costs of a cost object are related to the particular cost object and can be traced to it in an economically feasible (cost-effective) way.
- Indirect costs of a cost object are related to the particular cost object but cannot be traced to it in an economically feasible (cost-effective) way.

# Manufacturing Costs



#### **Direct Material**

# Cost of raw material that is used to make, and can be conveniently traced, to the finished product.

#### Example: Steel used to manufacture the automobile.

#### **Direct Labor**

#### Cost of salaries, wages, and fringe benefits for personnel who work directly on manufactured products.

#### **Example:**

Wages paid to an automobile assembly worker.

# Manufacturing Overhead

## All other manufacturing costs





Materials used to support the production process. Examples: lubricants and cleaning supplies used in an automobile assembly plant.

Indirect

Material

# Manufacturing Overhead

## All other manufacturing costs



# Manufacturing Overhead

## All other manufacturing costs

Indirect Material





Examples: depreciation on plant and equipment, property taxes, insurance, utilities, overtime premium, and unavoidable idle time.

#### **Opportunity Costs**

An opportunity cost is defined as the benefit that is sacrificed when the choice of one action precludes taking an alternative course of action.



# All costs incurred in the past that cannot be changed by any decision made now or in the future are sunk costs.

Sunk costs should **NOT** be considered in decisions.

 Example: You bought an automobile that cost \$22,000 two years ago. The \$22,000 cost is sunk because whether you drive it, park it, trade it, or sell it, you cannot change the \$22,000 cost.

# Variable Costs

- Costs that vary in total directly and proportionately with changes in the activity level.
  - Example: If the activity level increases 10 percent, total variable costs increase 10 percent.
  - Example: If the activity level decreases by 25 percent, total variable costs decrease by 25 percent.
- Variable costs remain the same per unit at every level of activity.

# Variable Costs Illustration of total variable costs

Damon Company manufactures tablet computers that contain a \$10 camera. The activity index is the number of tablets produced. As Damon manufactures each tablet, the total cost of the cameras used increases by \$10. As part (a) of **ILLUSTRATION 5.1** shows, total cost of the cameras will be \$20,000 if Damon produces 2,000 tablets, and \$100,000 when it produces 10,000 tablets. We also can see that a variable cost remains the same per unit as the level of activity changes.



# Variable Costs Illustration of unit variable costs

Damon Company manufactures tablet computers that contain a \$10 camera. The activity index is the number of tablets produced. As Damon manufactures each tablet, the total cost of the cameras used increases by \$10. As part (b) of **ILLUSTRATION 5.1** shows, the unit cost of \$10 for the camera is the same whether Damon produces 2,000 or 10,000 tablets.



#### Variable Costs Behavior of total and unit variable costs



مثال توضيحي

Total variable cost/\$ changed	variable cost per unit/\$ unchanged	activity level
10	10	1
100	10	10
1000	10	100
10000	10	1000
20000	10	2000
100000	10	10000

# **Fixed Costs**

- Costs that remain the same in total regardless of changes in the activity level within a relevant range.
- Fixed cost per unit cost varies inversely with activity: As volume increases, unit cost declines, and vice versa.

#### • Examples:

- Property taxes
- Insurance
- o Rent
- Supervisory salaries
- Depreciation on buildings and equipment

#### **Fixed Costs Illustration of total fixed costs**

Damon Company leases its productive facilities at a cost of \$10,000 per month. Total fixed costs of the facilities will remain constant at every level of activity, as part (a) of **Illustration 5.2** shows.



# **Fixed Costs Illustration of fixed costs per unit**

Damon Company leases its productive facilities at a cost of \$10,000 per month. Total fixed costs of the facilities will remain constant at every level of activity. But, **on a** per unit basis, the cost of rent will decline as activity increases, as part (b) of **Illustration 5.2** shows. At 2,000 units, the unit cost per tablet computer is  $5($10,000 \div$ 2,000). When Damon produces 10,000 tablets, the unit cost of the rent is only \$1 per tablet (\$10,000 ÷ 10,000).



# **Fixed Costs Behavior of total and unit fixed costs**

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# fixed cost

#### A fixed cost remains unchanged in total as the level of activity.

	Unit cost	Total cost
Fixed cost	changed	unchanged

# **Managerial Accounting**

#### **Dr. Hussein Al-Shammari**

#### **Mixed Costs**

- Costs that have both a variable element and a fixed element. هي التكاليف التي عنصر ثابت و عنصر متغير
- Change in total but not proportionately with changes in activity level.



- التكاليف الثابتة هي التكاليف التي تبقى ثابتة بمجموعها على
  الرغم من تغير حجم النشاط
  - التكاليف المتغيرة هي التكاليف التي تتغير مع تغير حجم
    النشاط بشكل مناسب
  - التكاليف المختلطة التكاليف التي تتغير بنسبة اقل من التغير في حجم النشاط

# Do It! 1: Types of Costs

Helena Company, reports the following total costs at two levels of production.

Classify each cost as variable, fixed, or mixed.

		10,000 Units	20,000 Units
Variabla	Direct materials	\$20,000	\$40,000
variable	Maintenance	8,000	10,000
Fixed -	Direct labor	17,000	34,000
rixeu	Indirect materials	1,000	2,000
Mixed	Depreciation	4,000	4,000
	→ Utilities	3,000	5,000
	Rent	6,000	6,000

#### High-Low Method Formula for variable cost per unit

**Step 1**: Determine variable cost per unit using the following formula: تحديد الكلفة المتغيرة للوحدة الواحدة

Change inTotal Costs at High÷High minus Low=Variable Costversus Low Activity LevelActivity Levelper Unit

### High-Low Method Computation of variable cost per unit

Metro Transit Company has the following maintenance costs and mileage data for its fleet of buses over a 6-month period.

Month	Miles Driven	Total Cost	Month	Miles Driven	Total Cost
January	20,000	\$30,000	April	50,000	\$63,000
February	40,000	48,000	May	30,000	42,000
March	35,000	49,000	June	43,000	61,000

Change in Costs (63,000 - 30,000)

High minus Low (50,000 - 20,000)

 $\frac{\$33,000}{30,000} = \$1.10 \text{ cost per unit}$ 

## High-Low Method Computation of fixed costs

**Step 2:** Determine the total fixed cost by subtracting the total variable cost at either the high or the low activity level from the total cost at that activity level.

	А	В	С	D		
1	1 METRO TRANSIT					
2	Activity Level					
3			High	Low		
4	Total cost		\$63,000	\$30,000		
5	Less:	Variable costs				
6		50,000 $ imes$ \$1.10	55,000			
7		20,000 $ imes$ \$1.10		22,000		
8	Total fixed costs		\$ 8,000	\$ 8,000		
9						

### **High-Low Method** Total costs for 45,000 miles

Maintenance costs are therefore \$8,000 per month of fixed costs plus \$1.10 per mile of variable costs. This is represented by the following formula:

Maintenance costs = \$8,000 + (\$1.10 × Miles driven)

Example: At 45,000 miles, estimated maintenance costs would be:

Fixed		\$8,000
Variable	(\$1.10×45,000)	<u>49,500</u>
		\$57,500

## High-Low Method Question

Mixed costs consist of a:

- a. Variable cost element and a fixed cost element.
- b. Fixed cost element and a controllable cost element.
- c. Relevant cost element and a controllable cost element.
- d. Variable cost element and a relevant cost element.

## High-Low Method Answer

Mixed costs consist of a:

- a. Answer: Variable cost element and a fixed cost element.
- b. Fixed cost element and a controllable cost element.
- c. Relevant cost element and a controllable cost element.
- d. Variable cost element and a relevant cost element.
## **Do It! 2: High-Low Method**

Byrnes Company accumulates the following data concerning a mixed cost, using units produced as the activity level.

	Units Produced	Total Cost
March	9,800	\$14,740
April	8,500	13,250
May	7,000	11,100
June	7,600	12,000
July	8,100	12,460

(a) Compute the variable- and fixed-cost elements using this method.

- (b) Using the information from part (a), write the cost formula.
- (c) Estimate the total cost if the company produces 8,000 units.

#### Do It! 2: High-Low Method Part (a) solution

	Units Produced	Total Cost
March	9,800	\$14,740
April	8,500	13,250
Мау	7,000	11,100
June	7,600	12,000
July	8,100	12,460

(a) Compute the variable- and fixed-cost elements using this method.

Variable cost: 
$$\frac{(\$14,740 - \$11,100)}{(9,800 - 7,000)} = \$1.30$$
 per unit

**Fixed cost**: \$14,740 - \$12,740 (\$1.30 × 9,800 units) = **\$2,000** or \$11,100 - \$9,100 (\$1.30 × 7,000) = **\$2,000** 

#### Do It! 2: High-Low Method Part (b) solution

	Units Produced	Total Cost
March	9,800	\$14,740
April	8,500	13,250
Мау	7,000	11,100
June	7,600	12,000
July	8,100	12,460

(b) Using the information from your answer to part (a), write the cost formula.

Cost = \$2,000 + (\$1.30 × units produced)

#### Do It! 2: High-Low Method Part (c) solution

	Units Produced	Total Cost
March	9,800	\$14,740
April	8,500	13,250
Мау	7,000	11,100
June	7,600	12,000
July	8,100	12,460

(c) Estimate the total cost if the company produces 8,000 units.

#### Total cost (8,000 units):

\$2,000 + \$10,400 (\$1.30 × 8,000) = **\$12,400** 

#### **Managerial Accounting**

Dr. Hussein Al-Shammari

#### contribution margin.

#### **Cost-volume-profit (C V P) analysis**

**Cost-volume-profit (CVP) analysis** is the study of the effects of changes in costs and volume on a company's profits.

دراسة اثار التغيرات على الكلفة والحجم على ارباح الشركة

- Important in profit planning.( (مهم في تخطيط الربح)
- Critical factor in management decisions as( عامل حاسم في قرارات الادارة)
  - Setting selling prices,( تحديد سعر البيع)
  - Determining product mix, and( تحديد مزج المبيعات)
  - Maximizing use of production facilities.( تعظيم الاستفادة من مرافق الانتاج).

#### **Cost-Volume-Profit Analysis**

#### **Basic Components**



#### **Basic Components**

#### Assumptions

- 1. Behavior of both costs and revenues is linear throughout the relevant range of the activity index.
- 2. Costs can be classified accurately as either variable or fixed.
- 3. Changes in activity are the only factors that affect costs.
- 4. All units produced are sold.
- 5. When more than one type of product is sold, the sales mix will remain constant.

#### **CVP Income Statement** Assumed selling and cost data

Vargo Video Company produces cell phones. Relevant data for the cell phones sold by this company in June 2020 are as follows.

Unit selling price of cell phone(سعر البيع للوحدة)	\$500
(الكلفة المتغيرة *Unit variable costs للوحدة )	\$300
Total monthly fixed costs** (التكاليف الثابتة الشهرية الإجمالية)	\$200,000
(الوحدات المباعة )Units sold	1,600

\*Includes variable manufacturing costs and variable selling and administrative expenses.

\*\*Includes fixed manufacturing costs and fixed selling and administrative expenses.

Cost-Volume-Profit Analysis قائمة الدخل CVP Income Statement

- A statement for internal use.
- Classifies costs and expenses as fixed or variable.
- Reports contribution margin in the body of the statement.
  - **Contribution margin** amount of revenue remaining after deducting variable costs.
- Reports the same net income as a traditional income statement.

#### **CVP Income Statement** Illustration

The CVP income statement for Vargo Video therefore would be reported as follows.

Vargo Video Company CVP Income Statement for the Month Ended June 30, 2020		
Total		
\$800,000		
480,000		
320,000		
200,000		
\$120,000		

#### **CVP Income Statement** Unit Contribution Margin

- Contribution margin is available to cover fixed costs and to contribute to income.
- Formula for **unit contribution margin** and the computation for Vargo Video are:

Unit Selling – Unit Variable		= Unit Contribution
Price	Costs	Margin
\$500	- \$300	= \$200

#### Unit Contribution Margin Sales of 1,000 units

Vargo's CVP income statement assuming a zero net income.

	Vargo Electronics CVP Income Sta For the Month Ended	s Compan tement June 30, 2020	y ,	
Sa Va Co Fii No	les $(1,000 \times \$500)$ wiable costs $(1,000 \times \$300)$ <b>ontribution margin</b> wed costs <b>et income</b>	Total \$500,000 300,000 200,000 \$ -0-	Per Unit \$500 300 <b>\$200</b>	

#### Unit Contribution Margin Sales of 1,001 units

Assume that Vargo sold one more cell phone, for a total of 1,001 cell phones sold.

Vargo Electronics Company CVP Income Statement For the Month Ended June 30, 2020				
	Total	Per Unit		
Sales (1,001 × \$500)	\$500,500	\$500		
Variable costs $(1,001 \times \$300)$	300,300	300		
Contribution margin	200,200	\$200		
Fixed costs	200,000			
Net income	\$ 200			

#### **CVP Income Statement** Contribution Margin Ratio

- Shows the percentage of each sales dollar available to apply toward fixed costs and profits.
- Formula for **contribution margin ratio** and the computation for Vargo Video are:

<b>Unit Contribution</b>	•	<b>Unit Selling</b>	=	<b>Contribution Margin</b>
Margin		Price		Ratio
\$200	÷	\$500	=	40%

#### contribution margin ratio

- Unit selling price -Unit variable costs ÷ Unit selling price
- ✤ 1- variable costs ratio
- Contribution margin(Total) ÷ Revenue(Total)

#### **Contribution Margin Ratio Comparative CVP income statements**

Assume Vargo Video's current sales are \$500,000 and it wants to know the effect of a \$100,000 (200-unit) increase in sales.

		Vargo Elec CVP Ir For the Mon	ctronics Compa ncome Statement th Ended June 30, 20	ny 20		
		No Change		With \$1	00,000 Increase	e in Sales
			Percent of			Percent of
	Total	Per Unit	Sales	Total	Per Unit	Sales
Sales	\$500,000	\$500	100%	\$600,000	\$500	100%
Variable costs	300,000	300	60	360,000	300	60
<b>Contribution margin</b>	200,000	\$200	40%	240,000	\$200	40%
Fixed costs	200,000			200,000		
Net income	\$ -0-			\$ 40,000		

#### **Do It! 3: CVP Income Statement**

Ampco Industries produces and sells a cell phone-operated thermostat. Information regarding the costs and sales of thermostats during September 2020 are provided below.

Unit selling price of thermostat	\$85
Unit variable costs*	\$32
Total monthly fixed costs**	\$190,000
Units sold	4,000

Prepare a CVP income statement for Ampco Industries for the month of September. Provide per unit values and total values.

#### **Do It! 3: CVP Income Statement** Solution

Prepare a CVP income statement for Ampco Industries for the month of September. Provide per unit values and total values.

#### Solution

#### **Ampco Industries**

#### CVP Income Statement For the Month Ended September 30, 2020

	Total	Per Unit
Sales	\$340,000	\$85
Variable Costs	128,000	32
Contribution Margin	212,000	<u>\$ 53</u>
Fixed Costs	190,000	_
Net Income	\$ 22,000	_

## **The Break-Even Point**

The break-even point is the point in the volume of activity where the organization's revenues and expenses are equal.

Sales	\$250,000
Less: variable costs	150,000
Contribution margin	100,000
Less: fixed costs	100,000
Net income	<b>\$</b> -

# Compute the break-even point using three approaches

- Equation Approach,
- Contribution margin, or
- from a cost-volume profit (C V P) graph

## **Equation Approach**

Sales revenue – Variable cost – Fixed costs = Profit



# **Equation Approach**

Break-even occurs where total sales equal variable costs plus fixed costs; i.e., net income is zero.

Computation of break-even point in units.

Required Sales	_	Variable Costs	_	Fixed Costs	=	Net Income	
\$500Q	_	\$300Q	_	\$200,000	=	\$0	
\$500Q	_	\$300Q	=	\$200,000	+	<b>\$0</b>	
\$200Q	=	\$200,000					
Q	=	\$200,000 \$200	=	Fixe Unit Contr	ed Co ibuti	osts ion Margin	
Q	=	1,000 unit	ts				
where							
Q	=	sales volume in units					
\$500	=	selling price					
\$300	=	variable costs per unit					
\$200,000	=	total fixed	co	sts			

## **Contribution Margin Technique**

• When the break-even-point in units is desired, contribution margin per unit is used in the following formula which shows the computation for Vargo Video:

Fixed	•	<b>Unit Contribution</b>	=	Break - Even
Costs		Margin		<b>Points in Units</b>
\$200,000	•	\$200	=	1,000 units

#### **Contribution Margin Technique** Formula for break-even point in dollars

• When the break-even-point **in dollars** is desired, contribution margin ratio is used in the following formula which shows the computation for Vargo Video:

Fixed	÷	Contribution	=	Break - Even
Costs		Margin Ratio		<b>Points in Dollars</b>
\$200,000	• •	40%	=	\$500,000

## **Contribution Margin Technique**

Curl, Inc. manufactures surfboards. Each surfboard sells for \$500 and has variable costs of \$300. Fixed costs \$80,000

#### Contribution-Margin Approach (1/3) Consider the following information developed by the accountant at Curl, Inc.:



## Contribution-Margin Approach (2/3)

Fixed expenses Unit contribution margin = Break-even point (in units)

	Total	Pe	r Unit	Percent
Sales (500 surfboards)	\$250,000	\$	500	100%
Less: variable expenses	150,000		300	60%
<b>Contribution margin</b>	\$100,000	\$	200	40%
Less: fixed expenses	80,000			
Net income	\$ 20,000			





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#### Contribution Margin Ratio (1/2)

Calculate the break-even point in *sales dollars* rather than units by using the contribution margin ratio.



<u>Fixed expense</u> = Break-even point CM Ratio = (in sales dollars)

#### **Contribution Margin Ratio (2/2)**

	1	<b>Total</b>	Pe	r Unit	Percent
Sales (400 surfboards)	\$2	00,000	\$	500	100%
Less: variable expenses	1	20,000		300	60%
<b>Contribution margin</b>	\$	80,000	\$	200	40%
Less: fixed expenses		80,000			
Net income	\$	-			

 $\frac{\$80,000}{40\%}$  = \\$200,000 in sales

#### Target Net Profit Safety Margin

# Questions

**Q1**- Fill in the blanks for each of the following independent cases.

π.

		Variable			Operating	Contribution
Case	Revenues	Costs	<b>Fixed Costs</b>	<b>Total Costs</b>	Income	Margin Percentage
a.		\$600		\$ 800	\$1,600	
b.	\$2,500		\$200		\$ 900	
c.	\$ 500	\$300		\$ 500		
d.	\$1,200		\$200			25%

case	Revenues	Variable cost	Fixed cost	Total cost	Operating Income	Contribution margin percentage				
Α	Ş	\$600	Ş	\$800	\$1,600	ç				
	Solution									
	operating in	come = R - tc		Total cost = f c + v c		contribution margin = R- VC				
	1600 =	r - 800		800 = f c + 600		Contribution margin = 2400- 800				
	R = 2	2400			f c = 200	Contribution margin= 1800				
						Contribution margin percentage =c m ÷ R				
						c m% =1800 ÷2400				
						c m% = % 75				

#### Case B

case	Revenues	Variable cost	Fixed cost	Total cost	Operating Income	Contribution margin percentage				
B	\$2,500	?	\$200	?	\$900	?				
	Solution									
	$Operating Income = R \\ - T C$			TC = FC + VC		CM = R - VC				
	900 =25		1600 =	= 200 + VC	C M = 2500 - 1400					
	T C = 1600			V C = 1400		C M = 1100				
						$CM\% = 1100 \div 2500$				
						<i>C M</i> % = 44 %				

case	Revenues	Variable cost	Fixed cost	Total cost	Operating Income	Contribution margin percentage
С	\$500	\$300	?	\$500	?	?
				Solu	ition	
	Operating Income =R- TC		T C = FC + V C		C M = R - V C	
	Operating In 500	come =500-		500= F C+ 300		C M = 500 - 300
	Operating Income $= 0$			FC = 200		C M = 200
						$C M \% = C M \div R$
						$C M \% = 200 \div 500$
						C M % = 40 %
case	Revenues	Variable cost	Fixed cost	Total cost	Operating Income	Contribution margin percentage
------	------------	------------------	---------------	-------------------	---------------------	--------------------------------
D	\$1,200	?	\$200	?	?	25%
				Solu	tion	
	O I= R- TC			T C= F C + V C		C M % = 1 - % V C
	O I= 120	00- 1100		T C=200 + 900		25% = 1 -V C %
	O I=	100		TC = 1	100	V C % = 75 %
						V C = R * V C %
						V C =1200 * 75%
						V C = 900

# Target Net Profit

When a company has a net profit they are trying to achieve, or a target net profit, the contribution margin approach can be used to determine the number of units that must be sold. This is very similar to finding the breakeven point. The numerator is equal to fixed expenses plus the target profit. The denominator is the contribution margin per unit. The result is the units that need to be sold to earn the targeted net profit.

## **Target Net Profit**

We can determine the number of surfboards that Curl, Inc. must sell to earn a profit of \$100,000 using the contribution margin approach.

Fixed cost + Target profit Unit contribution margin Units sold to earn the target profit



# Applying CVP Analysis

## Safety Margin

The difference between budgeted sales revenue and break-even sales revenue
The amount by which sales can drop before losses occur

# Safety Margin

- The safety margin of an enterprise is the difference between the budgeted sales revenue and the break-even sales revenue. This is the amount by which sales can drop before losses occur.
- For example, Curl, Inc. has a break-even point when sales are \$200,000. If actual sales are \$250,000, the margin of safety is \$50,000, which is 100 surfboards

# **Safety Margin**

Curl, Inc. has a break-even point of \$200,000 in sales. If actual sales are \$250,000, the safety margin is \$50,000, or 100 surfboards.

	Break	-even			
	sales				
	<b>400</b> u	units	5	00 units	
Sales	\$ 20	0,000	\$	250,000	
Less: variable cost	12	0,000		150,000	
Contribution margin	8	0,000		100,000	
Less: fixed cost	8	0,000		80,000	
Net income	\$	-	\$	20,000	

**Requirement 1:** Compute the monthly margin of safety in dollars if the company achieves its income goal.

Margin of safety in dollars = Expected sales – Break-even sales

**Requirement 1:** Compute the monthly margin of safety in dollars if the company achieves its income goal.

Margin of safety in dollars = Expected sales – Break-even sales

**Requirement 1:** Compute the monthly margin of safety in dollars if the company achieves its income goal.

Margin of safety in dollars	=	Expected sales – Break-even sales
	=	\$30,000 - \$9,000
	=	\$21,000

Margin of safety ratio =

Margin of asfaty ratio	=	Margin of safety in dollars
Margin of safety ratio		Expected sales in dollars

$= \frac{\$21,000}{\$30,000}$	Margin of safety ratio	=	Margin of safety in dollars Expected sales in dollars
		=	<u>\$21,000</u> \$30,000

=	Margin of safety in dollars Expected sales in dollars
=	<u>\$21,000</u> \$30,000
=	70%
	=

Q1/College Pizza delivers pizzas to the dormitories and apartments near a major state university. The company's annual fixed cost are \$40,000. The sales price of a pizza is \$10, and it costs the company \$5 to make and deliver each pizza. (In the following requirements, ignore income taxes.) Required:

<b>1-Using the contribution-margin approach, compute the company's even point in units (pizzas).</b>				break-
Break-even point (in units)= fixed cost ÷ unit contribution margin*	*unit con	tribution	margin=sj	p - vc
break-even point (in units) = $40000 \div 5 = 8000$ pizzas	10- 5 =	5		
2-What is the contribution-margin ratio?				
Contribution-margin ratio = unit contribution margin ÷unit sales price				
contribution-margin ratio = $5 \div 10 = 50 \%$				
<b>3-Compute the break-even sales revenue. Use the contribution-mar</b>	<mark>gin ratio</mark>	in your (	calculation of the second s	on
break-even sales revenue = fixed cost ÷ unit contribution margin ra	tio			
break-even sales revenue = $40000 \div 50 \% = 80000 \$$				
4- How many pizzas must the company sell to earn a target profit of	f <mark>\$65,000</mark>	? Use the	e equation	n
method				1
R - V C - FC = 65000				
(10 * Q) - (5 * Q) - 40000 = 65000				

	5Q = 1	105000			1	1					
	Q = 10	)500÷5	= 2100	00							
								-			
Rosario	o Compa	any, whi	ch is loo	cated in	Buenos	Aires, A	Argentin	ia, manu	factures	a comp	onent
used in	ı farm m	achiner	v. The fi	rm's fix	ted costs	s are 4.0	00.000	\$ per ve	ar. The	variable	cost
of each	compoi	nent is 2	2,000,\$	and the	compor	nents are	sold fo	r 3 000	\$ each '	The corr	nany
sold 5	000  com	nonents	during	the prio	r vear	ientes ure	5010 10	1 5,000	¢ cuem.		ipuily
solu 5,		iponents	uuring	the pho	n year .						
1-Comp	ute the b	reak-ever	n point in	units.			Г	1	1	1	
Break-e	ven point	(in units)	)= fixed c	ost ÷ uni	t contrib	ution mar					
break-ev	ven point	(in units)	= 400000	00 ÷ 1000	= 4000	1					
2- What	t will the	new brea	ik-even p	oint be if	f fixed co	sts increa	ase by 10	percent	?		
Break-e	ven point	t (in units	s)= fixed	cost ÷ un	it contril	bution ma					
break-e	ven point	(in units)	= 440000	00 ÷ 1000	= 4400				fc	4000000	44000000
									VC	2000	2000
									s p c m	1000	1000
										1000	1000
3- What w	vill the new b	oreak-even	point be if f	fixed costs o	decrease by	10 percent	?				
Break-eve	n point (in u	ınits)= fixeo	d cost ÷ unit	t contributio	on margin				fc	400000	3600000
break-eve	n point (in u	inits)= 3600	000 ÷ 1000	= 3600		1			vc	2000	2000
									s p	3000	3000
									<u>c m</u>	1000	1000
4- What w	/ill the new	l break-even	l point be if	variable co	l osts increas	e by 25 per	cent?	1	1	1	I
Break-eve	en point (in u	units)= fixe	d cost ÷ un	it contribut	ion margin				fc	4000000	4000000
break-eve	en point (in u	units)= 4000	0000 ÷500 =	8000	-				v c	2000	2500
									s p	3000	3000
									<mark>c m</mark>	1000	500

	1	1	1	T	1	r	1		T	·	
5-What wi	ll the new	break-even	point be if	variable co	sts decreas	e by 12.5 pe	ercent?	-	-		
Break-eve	n point (in	units)= fixe	d cost ÷ un	it contribut	ion margin				fc	4000000	4000000
break-even point (in units)= 4000000 ÷ 1250 =3200									V C	2000	1750
									s p	3000	3000
									<mark>c m</mark>	1000	1250
6- What w	/ill the new	break-eve	n point be i	f sales price	increase b	y 20 percen	it?				
Break-eve	n point (in	units)= fixe	d cost ÷ un	it contribut				fc	4000000	44000000	
break-eve	n point (in	units)= 400	0000 ÷ 1600	) = 2500					V C	2000	2000
									s p	3000	3600
									<mark>c m</mark>	1000	1600
7-What wi	ll the new	break-even	point be if	sales price	decrease by	20 percen	t?			·	
Break-eve	n point (in	units)= fixe	d cost ÷ un	it contribut	ion margin				fc	4000000	44000000
break-eve	n point (in	units)= 400	0000 ÷ 400 :	= 10000					V C	2000	2000
									s p	3000	2400
									<mark>c m</mark>	1000	400
What was	the compa	ny's net inc	ome for the	e prior year	?						
	[	NET INCOM	E								
R	Q*SP	5000 * 300	0	15000000							
VC	Q* U VC	5000* 200	0	1000000							
C M ***	Q* UMC	5000 * 100	0	5000000							
FC	4000000										
NI				1000000							

### Oslo Company prepared the following contribution format income statement based on a sales volume of 1,000 units

Sales	20000
Variable cost	12000
Contribution margin	8000
Fixed expenses	6000
Net income	2000

#### **Required:**

#### 1- What is the contribution margin per unit?

Total contribution margin (a)	\$8,000
Total units sold (b)	1,000 units
Contribution margin per unit (a) $\div$ (b) .	\$8 per unit

#### OR

The contribution margin per unit (\$8) can also be derived by calculating the selling price per unit of \$20 ( $$20,000 \div 1,000$  units) and deducting the variable expense per unit of \$12 (\$12,000 ÷ 1,000 units).

#### 2- What is the contribution margin ratio?

3- What is the variable expense ratio?					
Contribution margin ratio (a) ÷ (b)	40%				
Total sales (b)	\$20,000				
Total contribution margin (a)	\$8,000				

# Total variable expenses (a) ...... \$12,000 Total sales (b) ..... \$20,000

### 4- If sales increase to 1,001 units, what would be the increase in net operating income?

Contribution margin per unit (a)	\$8.00	per unit
Increase in unit sales (b)	1	unit
Increase in net operating income (a) $\times$ (b)	\$8.00	

### 5- If sales decline to 900 units, what would be the net operating income?

	Total	Per Unit
Sales (900 units)	\$18,000	\$20.00
Variable cost	10,800	12.00
Contribution margin	7,200	\$ 8.00
Fixed cost	6,000	
Net operating income	\$ 1,200	

### 6-If the selling price increases by \$2 per unit and the sales volume decreases by 100 units, what would be the net operating income?

	Total Per	Unit
Sales (900 units)	\$19,800	\$22.00
Variable cost	10,800	12.00
Contribution margin	9,000	\$10.00
Fixed cost	6,000	
Net operating income	\$ 3,000	

# 7- If the variable cost per unit increases by \$1, spending on advertising increases by \$1,500, and unit sales increase by 250 units, what would be the net operating income?

	Total	Per Unit
Sales (1,250 units)	\$25,000	\$20.00
Variable expenses	16,250	13.00
Contribution margin	8,750	\$ 7.00
Fixed expenses	7,500	
Net operating income	\$ 1,250	

#### 8-What is the break-even point in unit sales?

#### break-even point in unit =fixed cost ÷ unit contribution margin

- Q = \$6,000 ÷ \$8
- Q = 750 units

#### 9- What is the break-even point in dollar sales?

#### fixed cost ÷ contribution margin ratio

Sales = \$6,000 ÷ 0.40

Sales = \$15,000

10- How many units must be sold to achieve a target profit of \$5,000?

Profit = Unit CM × Q – Fixed expenses

 $5,000 = (20 - 12) \times Q - 6,000$ 

 $5,000 = (8) \times Q - 6,000$ 

\$8Q = \$11,000

Q = \$11,000 ÷ \$8

### 11-How many units must be sold to achieve a target profit of \$12000 tax net income 40%?

fixed cost + (Target after tax net income ÷ 1 - t )÷ contribution margin = 6000 + ( 12000 ÷ (1 - % 40)) ÷ 8 = 3250

### 12. What is the margin of safety in dollars? What is the margin of safety percentage?

Sales	\$20,000
Break-even sales (at 750 units)	15,000
Margin of safety (in dollars)	\$ 5,000
The margin of safety as a percentage of sales	is calculated as follows:
Margin of safety (in dollars) (a)	\$5,000
Sales (b) \$20,00	00
Margin of safety percentage (a) ÷ (b)	25%

# CVP Analysis with Multiple Products

## **CVP Analysis with Multiple Products**

For a company with more than one product, sales mix is the relative combination in which a company's products are sold.

Different products have different selling prices, cost structures, and contribution margins.

Let's assume Curl, Inc. sells surfboards and sailboards and see how we deal with break-even analysis.

### CVP Analysis with Multiple Products (1/2)

Curl provides us with the following information:

Descrip	otion	Sel Pr	ling ice	U Var C	nit iable cost	Con	Unit tribution Margin	Number of Boards	
Surfboa	ards	\$	500	\$	300	\$	200	500	)
Sailboa	ards		1,000		450		550	300	)
Total se	old							800	)
			Num	nber	%	of			=
	Desc	ription	of Bo	ards	To	tal			
	Surfb	oards		500	6	2.5%	(500 ÷ 800	0)	
	Sailb	oards		300	3	7.5%	(300 ÷ 800	0)	
	Total	sold		800	10	0.0%			

## CVP Analysis with Multiple Products – Weighted-Average Contribution Margin

Weighted-average unit contribution margin

	Weighted				
Description	Ma	rgin	% of Total	Contribution	
Surfboards	\$	200	62.5%	\$ 125.00	
Sailboards		550	37.5%	206.25	
Weighted-av	verage	contribu	tion margin	\$ 331.25	
\$200 × 62.5%					
	\$	550 × 37	.5%		

CVP Analysis with Multiple Products – Break-even Point (1/2)

Break-even point

Break-even = Fixed expenses point = Weighted-average unit contribution margin

Break-even  $= \frac{\$170,000}{\$331.25}$ 

Break-even = 514 combined unit sales

#### CVP Analysis with Multiple Products – Break-even Point (2/2) **Break-even point Break-even** 514 combined unit sales point **Break-even** Individual % of Description Total Sales Sales Surfboards 514 62.5% 321 Sailboards 514 193 37.5% **Total units** 514

# **Managerial Accounting**

### **Dr. Hussein Al-Shammari**

# DO IT! 3 | Make or Buy

Juanita Company must decide whether to make or buy some of its components for the appliances it produces. The costs of producing 166,000 electrical cords for its appliances are as follows.

Direct materials	\$90,000	Variable overhead	\$32,000
Direct labor	\$20,000	Fixed overhead	\$24,000

Instead of making the electrical cords at an average cost per unit of \$1.00 (\$166,000 ÷ 166,000), the company has an opportunity to buy the cords at \$0.90 per unit. If the company purchases the cords, all variable costs and one-fourth of the fixed costs are eliminated.

**a.** Prepare an incremental analysis showing whether the company should make or buy the electrical cords. **b.** Will your answer be different if the released productive capacity of the production facility will generate additional income of \$5,000?

#### Solution

#### a.

	Make	Buy	Net Income Increase (Decrease)
Direct materials	\$ 90,000	\$ -0-	\$ 90,000
Direct labor	20,000	-0-	20,000
Variable manufacturing costs	32,000	-0-	32,000
Fixed manufacturing costs	24,000	18,000*	6,000
Purchase price	-0-	149,400**	(149,400)
Total cost	\$166,000	\$167,400	\$ (1,400)

\*\$24,000 × .75 \*\*166.000 × \$0.90

This analysis indicates that Juanita Company will incur \$1,400 of additional costs if it buys the electrical cords rather than making them.

b.

		rvet meome
Make	Buy	Increase (Decrease)
66,000	\$167,400	\$(1,400)
5,000	-0-	5,000
71,000	\$167,400	\$ 3,600
	Make 66,000 5,000 71,000	Make         Buy           66,000         \$167,400           5,000         -0-           71,000         \$167,400

Yes, the answer is different. The analysis shows that net income increases by \$3,600 if Juanita Company purchases the electrical cords rather than making them. Method Products faces many situations where it needs to apply the decision tool learned in this chapter. For example, assume that in order to have control over the creative nature of its packaging, Method decides to manufacture (instead of outsourcing) some of its more creative soap dispensers. Suppose that the company has been approached by a plastic container manufacturer with a proposal to provide 500,000 Mickey and Minnie Mouse hand wash dispensers. Assume Method's cost of producing 500,000 of the dispensers is \$110,000, broken down as follows.

Direct materials	\$60,000	Variable manufacturing overhead	\$12,000
Direct labor	\$30,000	Fixed manufacturing overhead	\$ 8,000

Instead of making the dispensers at an average cost per unit of \$0.22 (\$110,000 ÷ 500,000), Method has an opportunity to buy the dispensers at \$0.215 per unit. If the dispensers are purchased, all variable costs and one-half of the fixed costs will be eliminated.

### Instructions

- a. Prepare an incremental analysis showing whether Method should make or buy the dispensers.
- b. Will your answer be different if the released productive capacity resulting from the purchase of the dispensers will generate additional income of \$25,000?
- c. What additional qualitative factors might Method need to consider?

	Make	Buy	Net Income Increase (Decrease)
Direct materials	\$ 60,000	\$ -0-	\$ 60,000
Direct labor	30,000	-0-	30,000
Variable manufacturing costs	12,000	-0-	12,000
Fixed manufacturing costs	8,000	4,000*	4,000
Purchase price	-0-	107,500**	(107,500)
Total cost	\$110,000	\$111,500	\$ (1,500)

\*\$8,000 × .50 \*\*\$0.215 × 500,000

This analysis indicates that Method will incur \$1,500 of additional costs if it buys the dispensers. Method therefore would choose to make the dispensers.

b.

			Net Income
	Make	Buy	Increase (Decrease)
Total cost	\$110,000	\$111,500	\$ (1,500)
Opportunity cost	25,000	_0_	25,000
Total cost	\$135,000	\$111,500	\$23,500

Yes, the answer is different. The analysis shows that if additional capacity is released, net income will be increased by \$23,500 if the dispensers are purchased. In this case, Method would choose to purchase the dispensers.

c. Method is very concerned about the image of its products. It charges a higher price for many of its products than those of its larger competitors. It therefore wants to ensure that the functionality of the dispenser, as well as the appearance, were up to its standards. Also, because of Method's commitment to sustainability, it would consider numerous qualitative issues. For example, is this supplier going to use sustainable manufacturing practices? Method currently requires that its suppliers meet its expectations regarding sustainability.

# الموارد النادرة

Duo Company manufactures two products, Uno and Dos. Contribution margin data follow.

	Uno	Dos
Unit sales	\$13.00	\$31.00
Less variable cost:		
Direct material	\$ 7.00	\$ 5.00
Direct labor	1.00	6.00
Variable overhead	1.25	7.50
Variable selling and administrative cost	.75	.50
Total variable cost	\$10.00	\$19.00
Unit contribution margin	\$ 3.00	\$12.00

Duo company's production process uses highly skilled labor, which is in short supply. The same employees work on both products and earn the same wage rate.

Required: Which of Duo Company's products is more profitable? Explain.

	Uno	Dos
Unit contribution margin	\$3.00	\$12.00
"Time units" required per unit of product	1	6
Contribution margin per "time unit"		
Uno: (\$3.00 ÷ 1)	\$3.00	
Dos: (\$12.00 ÷ 6)	I	\$ 2.00