WOLLO UNIVERSITY

COLLAGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ACCOUNTING AND FINANCE

DISTANCE MODULE FOR DEGREE PROGRAM

COST AND MANAGEMENT ACCOUNTING PART I (ACFN2091)

Prepared By: Naod Mekonnen (MSc.)

Selamawit Lemech (MSc.)

Editor: Kedir Seid (MSc.)

Distance Education Program

2019

Wollo University
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About the Course

Course Code	AcFn2091
Course Title	**Cost and Management Accounting I**
Degree Program	BA Degree in Accounting and Finance
Module	**Cost and** Management Accounting
ETCTS Credits	5
Credit Hour	3
Course Objectives & Competences to be Acquired	After successfully completing this course, the students should be able to: ▪ Describe and make use of the basic principles and practices of cost accounting. ▪ Differentiate cost accounting, management accounting and financial accounting ▪ Apply appropriate costing system to determine the cost of various cost objects. ▪ Apply for spoilage, reworked units, and scrap in job and process costing system. ▪ Determine cost of the product or service using job order costing, process costing and Activity Based Costing ▪ Distinguish variable and absorption costing as used in product costing. ▪ Properly account for by products and joint product costs.
Course Description	Modern businesses need frequent information about business activities to plan accurately for the future, control business results, and make a proper appraisal of the performance of persons working in an organization. The fulfillment of their goals requires details about the costs incurred and benefits (revenues) obtained which are provided by what is known as "Cost Accounting". In Comparison, financial accounting does not provide management with detailed cost and revenue, information relevant to its needs. The course deals with detailed concepts about cost accounting practices, the theory and techniques of cost accounting. Cost behavior, cost identification and analysis, system for establishing costs, absorption and variable costing, cost allocation, managerial use of cost data, modern costing system nature and objective of management accounting.
Evaluation Type	Weight
Assignment	35%
Tutorial Attendance	5%
Final exam	60%
Total	100%

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CHAPTER ONE: INTRODUCTION

Learning objectives:

Dear students, after completing this chapter you should be able to:

- ☞ Define and differentiate between cost accounting, management accounting and financial accounting.
- ☞ Explain the importance of cost accounting, management accounting and financial accounting.
- ☞ Explain the cost-benefit philosophy and behavioral considerations in management accounting systems and the ethical considerations in management accounting.

1.1. Purpose of an Accounting System

Dear students, as you have learnt in principles of accounting course, ***accounting*** as a language of business, is defined as the process of identifying, analyzing, recording, measuring, summarizing, interpreting and communicating economic information to permit informed judgments and decisions by users of the information. It is also viewed as an information system that provides essential information about economic activities of an entity to various individuals and groups.

The subject of accounting includes three main fields. That are *cost accounting*, *financial accounting*, and *management (managerial) accounting*. Cost accounting is concerned with the measurement reports of financial and non-financial information related to the cost of acquisition and consumption of recourses. On the other hand, financial accounting is primarily concerned with the presentation of financial reports and communicates them to external parties for making decisions. The third field of accounting, managerial accounting deals with the provision of financial and non-financial information reports to internal parties who are responsible in discharging the management functions and decisions makings to achieve the goal of the organization.

Financial accounting is that basic process with management, investors, creditors, and other external parties as the users of the accounting information. Management accounting involves accumulating, classifying, interpreting, and presenting financial data primarily for management and other insiders. Financial accounting is governed by generally accepted accounting principles (GAAP), customs that have been adopted over time, and procedures and rules put forth by the Financial Accounting Standards Board (FASB). GAAP applies only to those cost accounting procedures that affect cost data, such as cost of goods sold and inventory used in financial statements. Generally, cost accounting is not subject to GAAP. Management uses cost accounting, a subset of management accounting, for planning and controlling operations and for decision making. The guiding light for cost accountants is usefulness. The cost data must be accumulated, classified, interpreted, and presented in ways that are useful to managers for decision making. A budget, the key to planning and controlling, involves cost accounting data. Where to set an optimal price for a product or service cannot be decided without knowing the cost of what is to be sold.

Although many of the examples in this course are product-related (cost accounting being traditionally viewed as a manufacturing support system), cost accounting is prevalent in and very useful to service-oriented firms. In fact, many financial service firms, like banks and insurance companies, make successful use of cost accounting to control, plan, and price their services. What is being; tracked in a cost accounting system is some type of cost object. A cost object is the cost of anything that management believes is important. For example, a cost object could be the cost of a product, the annual cost of running a department, the cost of maintaining a machine, or the cost of a checking account.

1.2. **Comparisons Among Accounting Systems**

The accounting system is the principal, and the most credible, quantitative information system in almost every organization. This system should provide information for four broad purposes:

- **Purpose 1:** Internal routine reporting to managers for (a) cost planning and control of operations and (b) performance evaluation of people and activities.
- **Purpose 2:** Internal routine reporting to managers on the profitability of products, brand categories, customer, and distribution channels, and so on. This information is used in marking decision on resource allocation and in some cases decisions on pricing.
- **Purpose 3:** Internal nonroutine reporting to managers for strategic and tactical decisions on matters such as formulating overall policies and long-range plans, new product development, investing in equipment, and special orders or special situations.
- **Purpose 4:** External reporting through financial statements to investors, government authorities, and other outside parties. To satisfy external purposes, businesses must report income and inventory costs in accordance with the generally accepted accounting principles that guide financial accounting.

Activity
Question 1: What are the purposes of accounting system?
_____
_____

To better understand the essence and importance of cost accounting, it is good to have some insight about the two major sub elements of the accounting information systems: Financial Accounting and Management Accounting. Financial Accounting focuses on reporting to external parties. It measures and records business transactions in accordance with generally accepted accounting principles (GAAP). The ultimate purpose of Financial Accounting is to prepare general-purpose financial statements for use by external parties. These statements report the results of past financial activities.

Management accounting, on the other hand, measures and reports financial and non financial information that managers use to make decisions so as to achieve organizational goals. It includes both historical and estimated data that management uses to manage day-to-day operations and plan the future. Management accounting is wider in scope and overlaps with financial accounting to the extent that management uses the financial

statements in directing current operations and planning the future. Management accounting focuses on internal reporting, and the reports of management accounting are not strictly governed by GAAP as they are meant for internal purposes only. The ruling criterion in management accounting is cost benefit analysis instead of generally accepted accounting principles. The end products of management accounting are tools of managerial planning and control.

Cost accounting provides information for both Financial and Management Accounting. Cost accounting is required all where cost information need to be collected and/or analyzed. Both require cost information; cost information is required for financial accounting to determine the cost of goods manufactured, or sold, and operational costs while preparing the Income Statement and to determine the value of inventories on the Balance sheet. Management accounting requires cost information to set product price, to identify potential areas that could be taken care of, or areas of possible cost reductions, and the like. Hence, cost accounting is important for both financial accounting and management accounting.

Both management and external parties share an interest in accounting information but the emphasis differ. Internal reporting focuses on management planning and controlling. This area is known as management accounting, focusing on internal customers, measures and reports financial and other information that assists managers in fulfilling goals of the organization. It is concerned with the first three purposes of an accounting system listed above. Financial accounting focuses on external reporting. It is concerned with the fourth purpose of an accounting system listed here above.

Cost accounting is indistinguishable from management accounting. The major purpose of cost accounting is to record, classify, accumulate and allocate the costs of company's products and services. This product costing is useful to managers for instance in setting prices. And it is also useful for inventory valuation and income determination (external purposes). Viewed from this angle, cost accounting is a part of management accounting plus a part of financial accounting.

Financial accounting is constrained by generally accepted accounting principles. These principles restrict the set of revenue and cost measurement rules and the types of items that are classified as assets, liabilities, and owners' equity in balance sheet. In contrast, management accounting is not restricted to those accounting principles acceptable for financial reporting. For example, a consumer products company may present a particular estimated "value" of a brand name (such as the Coca-Cola brand name) in its internal financial reports for marketing, although doing so is not in accordance with generally accepted accounting principles.

Financial accounting takes a historical perspective. The reports it generates focuses on what has happened in the past. In contrast, management accounting emphasizes the future, providing budgets and other future projections in addition to historical reports. Main points of distinction between cost accounting and management accounting are enumerated here under. (**Refer the table below**)

Areas of comparison	**Management Accounting**	**Financial Accounting**
▪ Report format	Flexible format, driven by user's	Based on generally accepted accounting principles
▪ Purposes of reports	Provide information for planning, control, performance measurement and decision making	Report on past performance
▪ Primary users	As a whole business or aggregate employees, Managers suppliers	Division, product wise owners, lenders, customers, government agencies
▪ Units of measurement	Historical or future dollars, physical measure in time or names of objects, or non monitory events technical innovation	Historical dollars
▪ Nature of information	Future oriented, objective for decision making, more subjective for planning relies on estimates	Historical objective (oriented)

▪ Frequency of reports	Prepared as needed, may or may not be a regular basis or a regular basis minimum of once	Prepared on a regular basis (minimum of once) a year
▪ Legal compulsion	As the discretion of management	Compulsory

1.3. Management Accounting Guidelines

Dear students, as it has been indicated previously, the field of cost and management accounting do not have their own guidelines. However, in every managerial process, certain guidelines (directives) are necessary for the purpose of allocating scarce resources, achieving targets and making sound decisions. For this reason, there are three important guidelines that help management accountants in providing the most value information in performing their functions. They are:

(a) Cost-benefit approach
(b) Behavioral and technical considerations and
(c) Different costs for different purposes.

(a) Cost benefit approach Management accountants continually face resource allocation decisions. A cost benefit approach should be used in these decisions. Resources should be spent if they promote decision making that better attains organizational goals in relation to the costs of those resources. The expected benefits from spending those resources should exceed their expected costs.

(b) Behavioral and Technical considerations: A management accounting system should have two simultaneous missions for providing information:

i) to help managers make wise economic decisions, and
ii) to motivate managers and other employees to aim and strive for goals of the organization.

Management is primarily a human activity that focus on how to help individuals do their jobs better. For example, it is often better for managers to personally discuss how to improve performance with underperforming workers rather than just sending these

workers a report highlighting their underperformance to others for further evaluation or punishment.

(c) **Different costs for different purposes.** The different costs for different purposes theme is the management accountant's version of the "one shoe does not fit all size" notion. A cost concept used for the external reporting purpose may not be an appropriate concept for internal routine reporting to managers. Consider the advertising costs associated with launching a major new product. For external reporting to shareholders, television-advertising costs are fully expensed in the income statement in the year they are incurred. In contrast, for evaluating management performance (internal reporting purpose), the television advertisement costs could be capitalized and then written off as expenses one several years,

1.4. Management Philosophies of Continuous Improvement

Dear students, what do you think about management philosophy mean? Management philosophies refers to the approaches, viewpoint, attitude, beliefs or attitudes of managers or other authorized and responsible individual in the managerial process to achieve their pre-planned objectives. Several significant management philosophies evolved to deal with expanding global competition:

These include:

i). Just in time operating Technique (JIT)

ii). Total quality management (TQM)

iii). Activity Based Management (ABM) and

iv). Theory of Constraints (TOC)

i). Just in time operating Technique (JIT)

The JIT requires that all resources including materials, personnel and facilities be acquired and used only as needed. Its objectives are to improve productivity and eliminate wastage. All employers are encouraged to continuously look for ways to improve processes and save time.

ii). Total Quality Management (TQM)

Total Quality management (TQM) is a philosophy that required all functions work together to build quality into the organization product or service. TQM focuses on improving product quality by identifying and reducing or eliminating the waste of resources caused by poor product or service quality. Emphasis is placed on using resources efficiently and effectively to prevent poor quality and on examining current operations to spot possible causes of poor quality. Improved quality of both work environment and the product or service is the goal of TQM.

iii). Activity Based Management (ABM)

ABM is an approach to managing an organization that identifies all major operating activities, determines what resources are consumed by each activity, identifies what causes resource, usage way of each activity, and categorizes the activities as either adding value to a product or service or not adding value (non-adding value).

iv). Theory of Constraints:

According to the theory of constraints (TOC), limiting factors or bottlenecks, occur during the production of any product or service. Once managers identify such a limitation or constraint, they can focus attention and resources on it and thus achieve significant improvements. TOC helps managers set priorities for how they spend their time and other resource.

Activity
Question 2: What are the major differences and similarities between financial and management accounting?

_____

1.5. Ethical Considerations in Management

Professional accounting organizations promote high ethical standards. Professional accounting organizations such as the **Institute of Management Accountants (IMA)**, the largest association of management accountants in the United States, play an important role in promoting high ethical standards. For example, the IMA has identified four standards of ethical conduct for management accountants: *competence*, *confidentiality*, *integrity*, and *objectivity*.

COMPETENCE

Each practitioner has a responsibility to:

1. Maintain an appropriate level of professional expertise by continually developing knowledge and skills.

2. Perform professional duties in accordance with relevant laws, regulations, and technical standards.

3. Provide decision support information and recommendations that are accurate, clear, concise, and timely.

4. Recognize and communicate professional limitations or other constraints that would preclude responsible judgment or successful performance of an activity.

CONFIDENTIALITY

Each practitioner has a responsibility to:

1. Keep information confidential except when disclosure is authorized or legally required.

2. Inform all relevant parties regarding appropriate use of confidential information. Monitor subordinates' activities to ensure compliance.

3. Refrain from using confidential information for unethical or illegal advantage.

INTEGRITY

Each practitioner has a responsibility to:

1. Mitigate actual conflicts of interest. Regularly communicate with business associates to avoid apparent conflicts of interest. Advise all parties of any potential conflicts.

2. Refrain from engaging in any conduct that would prejudice carrying out duties ethically.

3. Abstain from engaging in or supporting any activity that might discredit the profession.

CREDIBILITY

Each practitioner has a responsibility to:

1. Communicate information fairly and objectively.

2. Disclose all relevant information that could reasonably be expected to influence an intended user's

understanding of the reports, analyses, or recommendations.

3. Disclose delays or deficiencies in information, timeliness, processing, or internal controls in conformance with organization policy and/or applicable law.

Activity
Question 3: List the four standards of ethical conduct for management accountants?_____

1.6. Chapter Summary

Cost accounting is an accounting that provides cost information not only for determination of cost of something but also for controlling of costs of activities (products, services, projects, departments, processes, etc) and for decision-making. Cost accounting concerned with recording, classifying and summarizing costs for determination of costs of products or services, planning, controlling and reducing costs and furnishing of information to management for decision making.

The term management accounting refers to an accounting for the management, i.e. accounting that provides necessary information to the management for discharging its functions. The functions of the management are planning, organizing, directing and controlling. Thus, Management accounting provides information to management so that planning, organizing, directing and controlling of business operations can be done in an orderly manner.

Financial accounting- is defined as the art of recording, classifying, measuring and summarizing in a significant manner and in terms of money, transactions and events, which are in part at least, of a financial character and interpreting the results thereof.

1.7. Self-Test Questions

Now, this unit is completed you must have to test your progress by doing the following self-test and compare your answer with the answer key given at the end.

Now, this unit is completed you must have to test your progress by doing the following self-test and compare your answer with the answer key given at the end.

True or false items

1. Managerial accounting is a branch of financial accounting and serves essentially the same purposes as financial accounting.
2. Although financial and managerial accounting differ in many ways, they are similar in that both rely on the same underlying financial data.

Multiple choice

3. The function of management that compares planned results to actual results is known as:
    A. planning.
    B. implementing
    C. Evaluating
    D. communicating
    E. none
4. financial accounting differs from management accounting in one of the following area:
    A. It provides financial and non- financial information.
    B. The report format is based on the users need.
    C. The users of the financial information are internal.
    D. The time spans of the report usually covers one year or less.
    E. None
5. Which of the following statement is incorrect about the ethical conduct for management accountants?
        A. Refrain from using confidential information for unethical or illegal advantage.
        B. Perform professional duties in accordance with relevant laws, regulations and technical standards.
        C. Refrain from engaging in any supporting activity discredit the profession.
        D. All
        E. None

Fill in the blank

6. _____ is an accounting which primarily concerned with the

summarizations and presentations of revenues and expenses of a specified period and shows the financial position of a particular entity at a specific date for external parties.

7. _____is guideline (method) are necessary for the purpose of allocating scarce resources, achieving targets and making sound decisions.
8. One of a Standard of Ethical Conduct for Management Accountant which Maintain an appropriate level of professional expertise by continually developing knowledge and skills is called_____.

CHAPTER TWO: INTRODUCTION TO COST TERMS AND COST CLASSIFICATIONS

Learning objectives:

Dear students, after completing this chapter you should be able to:

- ☞ Differentiate between Cost and Expense.
- ☞ Explain what a cost object is and distinguish between direct and indirect costs.
- ☞ Describe cost behavior; variable and fixed.
- ☞ Describe the three manufacturing costs.
- ☞ Differentiate between product and period costs.
- ☞ Explain the difference between the financial statements of Service, Merchandising, and Manufacturing Companies.

2.3. Cost Terminologies and Concepts

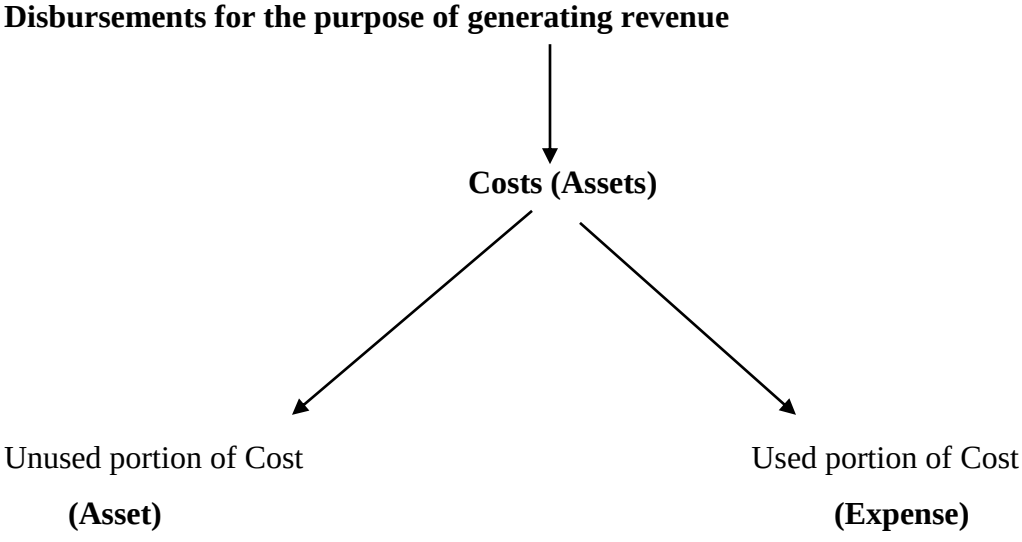
Dear students, in the previous chapter you have learnt the concepts of cost accounting, management accounting and financial accounting. This course (part I) mainly deals with cost accounting and the next part of this course will focus on management accounting. In this chapter you will learn about different cost concepts and classification that will be used for these two consecutive courses (Part I and II).

Many accounting reports contain several cost terminologies. A good understanding of the different cost terminologies is essential at least for the following two reasons: number one, it enables accounting information users to best use the provided information. Number two; use of common cost terminologies avoids confusion and misunderstanding. One of the common confusions is the distinction between costs and expenses. Many people use costs and expenses interchangeably. Thus, we start with the definition of costs and expenses.

Costs are all disbursements that are incurred in the course of generating revenue. For instance, purchase of raw materials represents a cost as the raw material is used to

produce finished goods that generate revenue when sold. From the above definition, we can also understand that not all disbursements represent costs. For example, the payment of dividend is a disbursement but it does not help generate revenue. Hence, dividend is not a cost.

All costs initially represent assets. As the assets are used in generating revenue, the amount consumed becomes an expense. The costs of the assets used should then be recognized as expenses so as to properly match revenues and expenses in the process of determining the income of the organization over a given period. For instance, Insurance Premiums paid in advance to serve the coming period are initially recognized as assets, but as time passes on the asset continually change to an expense. Another example may be a motor vehicle bought for use in the coming five years is an asset when initially purchased. However, as the asset is used up in the process of generating revenue, the cost gradually becomes an expense. Thus, expenses are expired costs, or costs used up in the course of generating revenue. The figure on the next page may show the distinction between costs and expenses.



The distinction between costs and expenses is important for the preparation of financial statements for service, merchandising and manufacturing firms. However, it has more importance for manufacturing enterprises. This is because costs incurred in the

manufacturing process do not become expenses until the product is sold and thus, items that are fully or partially manufactured represent costs and should be recognized as assets on the Balance sheet. Therefore, financial reporting in manufacturing firms has some complication as compared to financial reporting in the service and merchandising businesses. The coming three chapters are about costing in manufacturing firms, and hence we focus on manufacturing costs in particular in the following part of this chapter.

2.4. Costs in a Manufacturing Firm

Manufacturing firms normally purchases raw materials and then change these raw materials into finished goods by combining human talent and machinery. The cost of any product is then the combination of cost of materials used, direct labor employed and cost of machineries. These manufacturing costs are commonly known as direct materials, direct labor, and manufacturing overhead or indirect manufacturing costs. The classification of these costs as direct and indirect is in relation to the cost object with which they are associated. A ***cost object*** is anything that deserves a separate measurement of costs. A cost object can be a product, a process, or a department. Some costs can exclusively traceable to the cost object, and thus, are called **direct costs**. On the other hand, there are costs that cannot be directly traceable to the cost object easily because of some reason, such costs are called **indirect costs**.

Direct costs are costs that can be directly traced to a cost object in an economically feasible way. For instance, cost of lumber can be a direct cost of furniture products like coffee tables, and chairs. Cost of lumber is a direct cost because the cost of lumber can be directly traced to the coffee table, and chair manufactured. In addition, the cost of lumber is material enough to be assigned to the cost object (the coffee table, and chairs) in a cost-effective way. Thus, when we talk about direct cost there are two things to consider: one is whether the cost can be directly traced to the cost object, and the other is whether that cost is traced to the cost object economically.

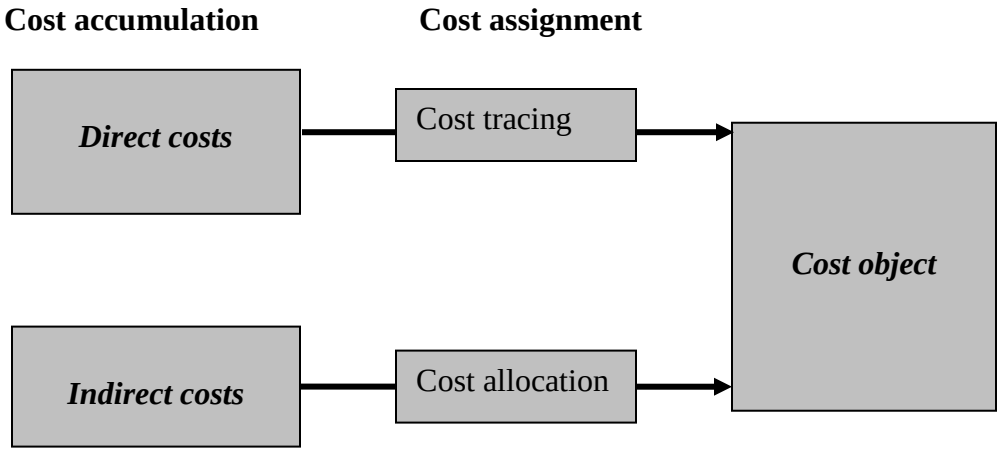
In a manufacturing firm, direct costs encompass direct material and direct labor. A direct material is the cost of material that is directly entered into the manufactured product.

However, this is a necessary condition but not sufficient to classify the cost as direct. That cost must also represent a significant portion of the total cost of the product manufactured. For instance, glue and nails are one of those materials that directly enter into the final product. However, their cost does not justify being treated as direct material because of the fact that the high cost of maintaining bookkeeping records for such a small amount is more than the benefit of treating them as direct material. Such items are called indirect materials.

A direct labor represents the wages paid to those individuals who exclusively work for the cost object. For instance, wages paid to assemblers in an automobile manufacturer is considered as direct labor. However, wages paid to supervisory personnel is not a direct cost because it cannot be traced to a single cost object. That cost is common to more than one cost object, and thus cannot be traced to a cost object directly.

Indirect costs are costs that are related to a cost object but cannot be traced to the cost object directly and in an economically feasible way. It includes indirect materials, indirect labor and other manufacturing costs. Some of these costs are common costs that relate to more than one cost object, and hence cannot be directly traced to a specific cost object. Indirect manufacturing costs are also called **manufacturing overhead**, manufacturing burden or factory overhead. Even though such costs cannot be directly traced to the cost object, they should be allocated to the many cost objects in some way.

The diagram shows direct and indirect cost assignment to a cost object.



Activity
Question l: What is cost? _____
_____

The classification of costs as direct and indirect is not absolute. The same cost can be indirect in relation to one cost object and may be direct for another cost object. The classification of costs as direct and indirect is, therefore, defined in relation to the cost object. Thus, the cost object must first be identified; otherwise the classification may suffer from a thought that renders it meaningless.

2.5. Cost Classifications

Dear students, the costs previously discussed based on the purpose, nature or behavior can be reclassified in different ways. In this section you will explore about the different classifications.

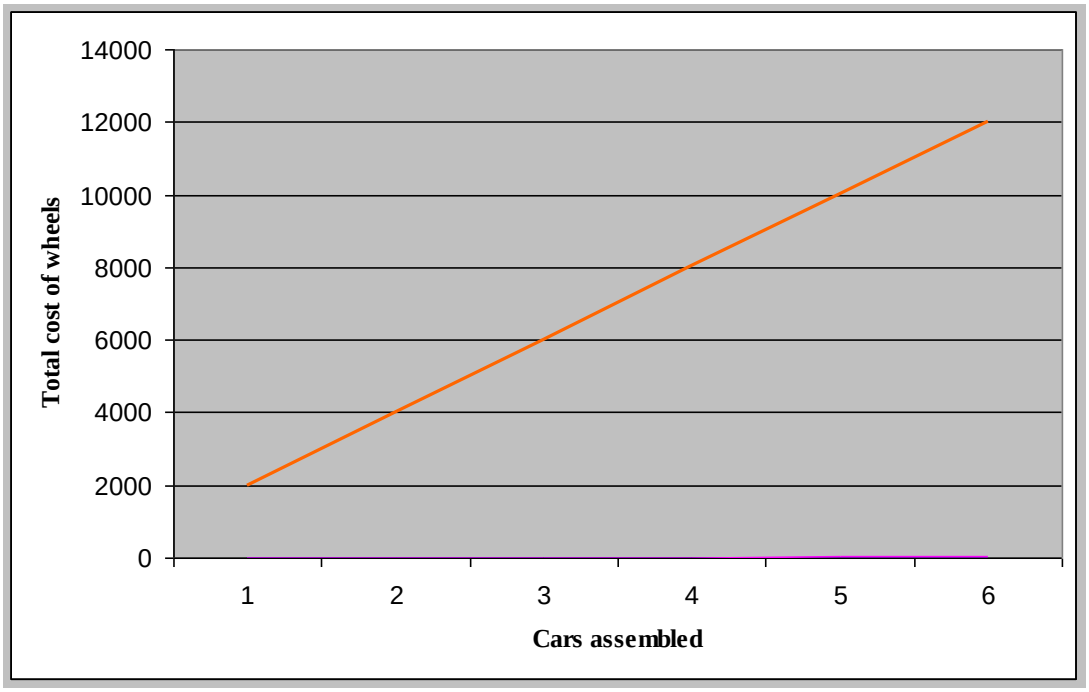
Cost behavior: Variable and Fixed costs

A cost can be classified as variable or fixed depending on how the cost behaves as the volume of activity changes. Some costs respond correspondently with the volume of activity. As the volume of activity increases, the cost increases, and as the volume of activity falls, the cost drops. Yet there are costs that do not respond to a change in the volume activity. Such costs are called fixed cost.

Variable costs are those costs that varies in total as the volume of activity changes; the total dollar amount rise, when the volume of activity increases, and falls when the volume of activities go down. However, the unit cost remains the same. For instance, a car assembler needs steering wheel for the cars it assembles. The number of steering wheels required depends on the number of cars assembled. For instance, if four wheels are required for a single car, then for four cars, sixteen wheels are required, for eight cars, thirty two wheeling tires are needed. Assuming that one car need four wheel and one wheel costs Birr 500.00, the following table shows a comparison between the total cost and total cars assembled.

Volume of activity (cars)	**Total wheels required**	**Cost of total wheels**
1	4	2,000.00
2	8	4,000.00
3	12	6,000.00
4	16	8,000.00
5	20	10,000.00
6	24	12,000.00

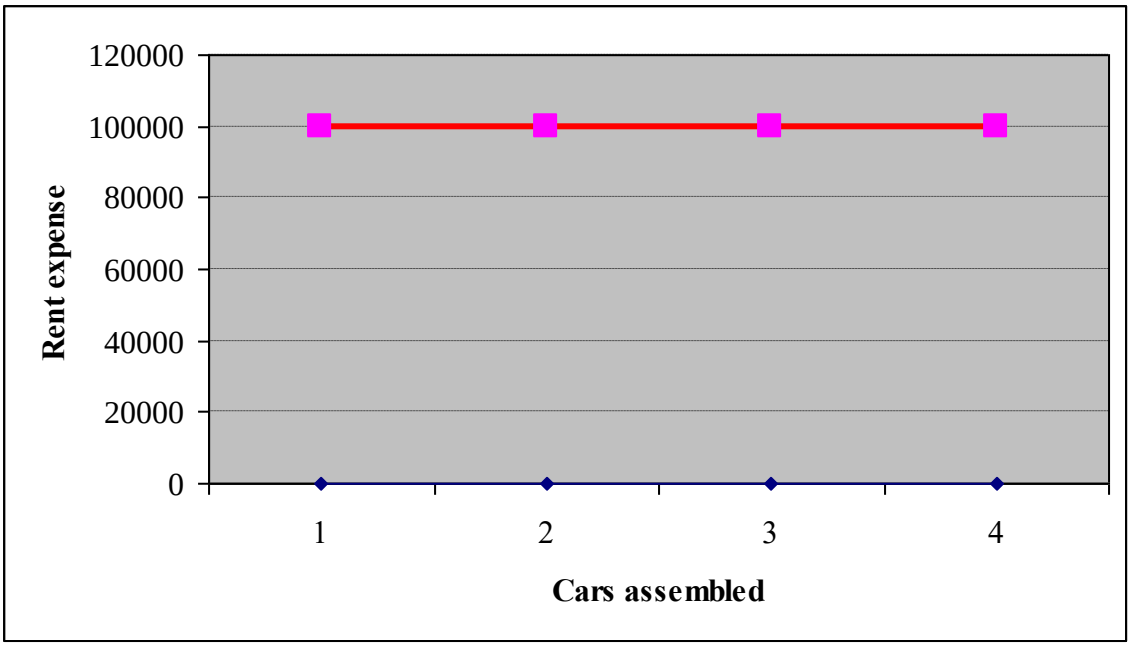
Graphically, the relationship between the total cost of wheel and cars assembled looks the following:



The graph shows that the total cost of wheels increases as the number of cars assembled increases. You should mark that it is only the total cost that varies with the volume of the activity; the unit cost is the same. In the example above, the unit cost of the wheel is birr 500.00 at each level of activity.

Fixed costs are those cost that remain constant in total dollar amount as the level of activity changes. For instance, in the above example the wages of janitors and guards is constant in spite of the number of cars assembled. Another example may be the rent expense that Wollo University pays; the cost of rent does not increase whether the number of students enrolled is 1,000, 2,000, 3,000, or 4,000. It remains constant regardless of the number of students.

The graph below shows the nature of fixed costs over the relevant range.



When we talk about variable and fixed costs, we are talking about the total dollar amount instead of the unit cost. Assume that the car assembler in the previous example rented the factory site for Birr 100,000.00 per year. Whether 1000, 2000, 3000, or 4,000 cars are assembled in a year, the rent expense is the same. However, the unit cost varies. It decreases or increases as the volume of activities increases or decreases. For instance, the rent expense in the above example is Birr 100,000.00 in a year. The unit cost would be Birr 100 if 1000 cars are assembled, Birr 50 if 2000 cars are assembled, Birr 33.33 if 3000 cars are assembled and Birr 25 if 4000 cars are assembled. Thus, when we talk about variable and fixed costs, we are talking about the total dollar amount instead of the unit cost.

A fixed cost is fixed only over a certain range, which is called the **relevant range**. For instance, in the previous example, the factory rent expense will be fixed may be only up to 5000 car assembly. If the organization needs to assemble more cars, the factory may not host all the work. Thus, there comes a need to rent a spacious site that probably costs higher. Therefore, costs are fixed only over some range. If the volume activity exceeds that range the cost changes.

Some costs have both fixed and variable components. These costs are often called mixed costs, semi variable or semi fixed costs. For instance, the rental charges for a copier machine may be Birr 100 per month and Birr 0.1 per a page copy. The base payment 100 is fixed where as the Birr 0.1 charge per copy is variable.

Activity
Question 2: Distinguish between variable and fixed cost?

Product costs and period costs

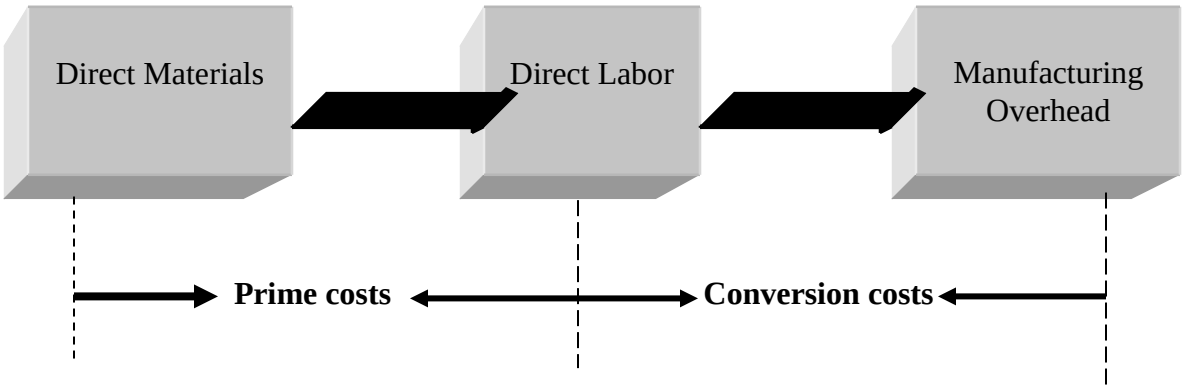
A product cost includes all costs that are assets when they are incurred and become cost of goods sold when the product is sold. All manufacturing costs: direct material, direct labor, and manufacturing overhead are products costs. These costs are also called manufacturing costs. Some of these costs first creates inventory of raw materials before going through some processes, and then the costs change into work in process as the raw materials purchased passes through the manufacturing processes, and eventually all manufacturing costs become finished goods. Until sold, these costs remain as assets in the form of finished good. Thus, such costs are also called inventoriable costs.

Period costs are those that are treated as expenses when they are incurred, as they are presumed to benefit only the current period. In manufacturing firms, these costs are also called non-manufacturing costs. They are not involved directly in the manufacturing process and mainly they expire as time passes on. The two types of period costs are selling costs, and administrative costs. Selling costs are those costs that are incurred in relation to the selling activities of the firm. Selling costs include, Advertising costs, Sales commission, Salespersons salaries, and Depreciation on Store Building, Delivery costs etc. Administrative costs are those costs that are incurred in relation to the administration of the firm. Such costs include among others, Office Supplies, Office Salaries, and Depreciation on Office Building.

The treatment of non-manufacturing costs, both Selling and Administrative, is very much similar among Manufacturing, Merchandising and Service enterprises. Most are recognized as expenses when incurred as they benefit only the current period.

Prime and conversion costs

The term prime cost refers to the sum of direct materials and direct labor used in production. Because it includes direct material and direct labor, prime costs are also called direct manufacturing costs. Conversion costs are the combination of direct labor and manufacturing overhead. Conversion costs are the costs of converting direct materials into finished manufactured part. Conversion costs are also called processing cost. The following diagram shows the interrelationship of product cost.



Controllable and Non-controllable costs

Some costs are controllable at some level of management within the organization and some costs are not. For instance, factory rent may be controllable at the vice president level but this cost cannot be altered by the decision of a foreman. Thus, factory rent is a controllable cost to the vice president but it is uncontrollable for the foreman.

Controllable costs are all costs that can be altered at a particular level of management. In the above example, the factory rent is a controllable cost to the Vice President. The Vice President is held accountable for the cost. Non-controllable cost, on the other hand, cannot be influenced or altered at that particular level of management. For instance, the factory rent cost cannot be influenced by the foreman and thus, the Foreman is not accountable to that cost. Nonetheless, all costs are controllable at top management level over the long run.

Unit costs and total costs

Units costs are the average cost of each units produced. Total cost represents the total cost of goods manufactured. Unit costs are computed by dividing total costs by the total units produced. Both total costs and unit costs are important in many areas. However, the use of unit cost requires some caution. Suppose 10,000 quintals of wheat flour are produced at a total cost of Birr 2,500,000.00. If 7,500 quintal of flour has been sold during the period, unit costs are essential to assign the total cost to cost of goods sold, and ending inventory.

The unit cost would be the total cost divided by the total units produced i.e.,

$$\frac{\text{Total manufacturing cost}}{\text{Number of units produced}} = \frac{2{,}500{,}000.00}{10{,}000} = \$\ 250.00 \text{ per quintal}$$

Cost of goods sold is then, Birr 250 X 7,500 1,875,000000

Ending inventory Birr 250 X 2,500 625.000.00

However, unit costs must be used with some precaution. Assume that out of the 2,500,000.00 total cost, the 500,000.00 is fixed that does not change over the relevant range. The management may forecast the cost for the upcoming period under different levels of production. Look at the following budget:

Units to be produced	**Variable cost per unit**	**Total variable cost**	**Total fixed cost**	**Total cost**	**Unit costs**
5,000	200	1,000,000.00	500,000.00	1,500,000.00	300.00
7,500	200	1,500,000.00	500,000.00	2,000,000.00	266.67
10,000	200	2,000,000.00	500,000.00	2,500,000.00	250.00
12,500	200	2,500,000.00	500,000.00	3,000,000.00	240.00
15,000	200	3,000,000.00	500,000.00	3,500,000.00	233.33

To take the unit cost of the previous year to forecast the future would lead to erroneous conclusion. The unit cost changes as the level of activity changes. For budgeted amount less than the previous year production, the unit cost is higher than Birr 250.00 as the fixed

cost will be absorbed by a relatively smaller amount. For an amount greater than 10,000, the unit cost falls as the fixed cost is shared by a relatively large number of units. So in using unit costs, it is better to analyze how that unit cost is composed of.

Other cost terminologies and concepts

Cost driver

A cost driver is a factor that casually affects costs over a given time span. For instance, there is a cause and effect relationship between volume of activity and total cost of a cost object. Thus, volume of activity is a cost driver. Costs that are fixed in the short run do not have a cost driver, though they may have a cost driver in the long run. Different types of costs respond to widely differing cost drivers.

Differential cost

Often managers are in a position to choose between two or more alternatives. Which alternative to pursue requires an evaluation of the different courses of action. An evaluation of the different courses of action is possible either by comparing the aggregate cost of each course of action or by looking at the differential cost only. Differential cost is the increase or decrease in cost that is expected from a particular course of action as compared with an alternative course of action. For instance, a shoe manufacturer can establish its own shoe tie processing factory or buy it from outside. Assume the cost of producing a pair of shoe tie is birr 0.5 and the cost of a pair of shoe tie bought from outside is Birr 0.4; the differential cost is Birr 0.20. Differential cost is also called incremental cost.

A special case of the differential cost is the marginal cost. Marginal cost represents the extra cost incurred when one additional unit is produced. Marginal costs differ across different ranges production as the efficiency of production varies along with production levels.

Sunk cost

These are costs that are already incurred and cannot be reversed by a subsequent decision. Except for its impact on income tax, sunk costs are irrelevant for future decision-making. For instance, you have constructed a hotel in an outskirt of a town

expecting that many people come and enjoy particularly on the weekends. However, after the hotel is constructed, you found only about 20% of the people you normally expect. Therefore, you want to change the hotel premises for other purposes. What is the importance of the construction cost for the proposed change? The cost incurred in constructing the hotel is a sunk cost that cannot be reversed and thus irrelevant for the decision on hand.

Opportunity cost

Opportunity cost is the income forgone while pursuing one course of action ignoring the next best alternative. For instance, assume you have Birr 20,000.00, and you are considering two things to do with this money. One option is to join a College, and the other option is to open a photocopy business. If you join the College, you may have an employment after three years, but you lose the money that you can get, had that sum been invested in the photocopy business. The opportunity cost of going to college is the income forgone had that money been invested in the photocopy business.

Opportunity cost differs fundamentally from other costs in that it does not represent a transaction that requires disbursement. However, opportunity costs should be considered in all managerial decisions.

Activity :
Question 3: Among the three costs classification for Decision Making , which cost is irrelevant for Decision Making and why?

2.6. Financial Statements of a Manufacturing firm

Financial statements of a Manufacturing company are more complex as compared to financial statements of Merchandising and Service companies. Particularly, the Balance sheet, and Income statement of a Manufacturing enterprise are somewhat different from their Merchandising and Service counterpart. All costs mentioned above should be properly accounted for and reported in the financial statements of a manufacturing firm, which is more complex than that of the Merchandising and Service complements.

2.6.1. Balance Sheet of a Manufacturing Firm

The Balance sheet of a manufacturing firm differs from the Balance sheet of a merchandising firm principally by the types of inventories reported. A manufacturing firm carries three types of inventories namely, Direct Materials, Work-In-Process, and Finished good. Inventory of Direct Material represents the costs of materials that are not yet entered into a manufacturing process. Such materials may be purely raw materials that have not received any processing before such as agricultural outputs, or they may be semi processed or fully processed products of another firm like wheat flour directly going into Biscuit in Food Complex industries.

Inventories of work in process represent all goods that are undergoing some manufacturing process but yet not finished to be dispatched for use by customers. The costs of work in process inventory include all the manufacturing costs incurred so far in the manufacturing process; the cost of direct materials, the costs of labor, and applied manufacturing overhead. The finished good inventory embodies the final product that is not yet sold. The cost of finished good inventory includes all manufacturing costs, direct material, direct labor, and manufacturing overhead incurred to produce that product. The following partial Balance Sheet may show the presentation of inventories in a Manufacturing firm.

ALEDER Furniture Factory

Balance Sheet

As at December 31, 2018

Current assets:

Cash on Hand	12,669.00
Cash in Bank	245,980.00
Account receivables	125,468.00
Allowance for doubtful account	4,578.00
	120,890.00
Inventories:	
Direct material	117,450.00

Work in process	131,600.00
Finished good	182,000.00
Total inventories	431,050.00

2.6.2. Income Statement of a Manufacturing Firm

Income statement of a manufacturing firm differs from income statement of a merchandising firm by the cost of goods manufactured caption. A merchandising firm sells goods after buying it from a manufacturing firm. But a manufacturing firm sells goods that are internally produced. Hence, the costs of goods sold caption contains cost of goods manufactured instead of purchase. The amount of purchase can easily be found from the ledger, but cost of goods manufactured cannot. Cost of goods manufactured must first be computed before the income statement is prepared.

A merchandising business can monitor operational performance more easily than a manufacturing business because they easily know their selling price and buying price. However, a Manufacturing firm cannot easily identify the cost of production. Further, there are rooms in a manufacturing business to make operations more efficient. Therefore, many manufacturing businesses prepare their income statements more frequently than merchandising businesses. Frequent preparation allows them to know the results of operation and thereby alter operational strategies if the results are not satisfactory.

For comparison purposes, here below you will find income statement of a merchandising and manufacturing business (a hypothetical example).

Tana Import PLC
Income statement
For the year ended December 31, 2018

Sales	1,200,000.00
Cost of goods sold:	

Merchandise inventory, January 1, 2018	120,000.00	
Purchase	**960,000.00**	
Merchandise available for sale	1,080,000.00	
Less Merchandise inventory December 31, 2018	240,000.00	
Cost of merchandise sold		840,000.00
Gross profit		**360,000.00**
Operating expenses:		
Selling expenses	85,000.00	
Administrative expenses	75,000.00	
Total operating expenses		160,000.00
Net income		**200,000.00**

Alder Furniture Factory

Income statement

For the year ended December 31, 2018

Sales		1,831,600.00
Cost of goods sold:		
Finished good inventory, January 1, 2018	157,000.00	
Cost of goods Manufactured	1,101,750.00	
Cost of finished goods available for sale	1,258,750.00	
Less finished goods inventory December 31, 2018	182,000.00	
Cost of merchandise sold		**1,076,750.00**
Gross profit		**754,850.00**
Operating expenses:		
Selling expenses	330,000.00	
Administrative expenses	168,850.00	
Total operating expenses		498,850.00
Net income		**256,000.00**

A comparison of the two statements shows the following facts. Purchase in a merchandising firm represents goods that are bought over a definite specified period, a year in the above example. The total purchase made in that period is added to the beginning inventory balance and yield the total cost of goods available for sale in that period. The manufacturing equivalent is the cost of goods manufactured, which represent the total manufacturing cost of goods produced in that period or year.

The cost of goods manufactured by it self needs a computation that presents the cost of direct material used, cost of direct labor incurred, and factory overhead costs. The direct material used alone is a separate schedule that shows the direct material placed in production in that period. In general the following four steps are required to prepare income statement of a manufacturing firm.

Step 1 – The schedule of Direct Materials used in production

The cost of direct material used is equivalent to the beginning inventory of direct material plus purchases made during that period less the direct material left at the end of the period. For illustration purposes, the above income statement of Alder Furniture Factory will be used.

Direct Materials used = Beginning Direct Materials inventory + Direct Materials Purchased – Ending Direct Materials inventory

Assume that the direct materials inventory of Alder Furniture Factory amounts to Birr 124,000.00 at the beginning of the year i.e., as of July 1, 2018, purchases of Birr 440,000.00 and freight costs Birr 1,600.00 is made during the year, and the amount of direct materials inventory at the end of the year is Birr 117,450.00. The direct material used is therefore will be shown in the schedule below.

Schedule 1- Schedule of direct material used

Beginning direct material inventory	124,000.00

Add: Total cost of direct materials purchased	
Direct materials purchased	440,000.00
Freight in	1,600.00
	441,600.00
Direct materials available for use	565,600.00
Deduct: Ending direct materials inventory	117,450.00
Direct materials used in production	**448,150.00**

This schedule can be presented either separately or can be incorporated to the cost of goods manufactured schedule.

Step 2 – The schedule of cost of goods manufactured

To determine the cost of goods manufactured, three factors are necessary: cost of direct materials used, cost of direct labor, and manufacturing overhead. Extending the same example, let say the cost of direct labor employed is Birr 437,500, and the following overhead costs are incurred:

Indirect labor	98,600.00
Depreciation on factory equipment	44,600.00
Light and power	43,600.00
Depreciation of Factory building	12,000.00
Insurance expense on factory properties	9,500.00
Property tax	19,500.00
Factory supplies expense	5,800.00
Miscellaneous factory costs	4,100.00
Total overhead	**237,700.00**

Cost of goods manufactured = beginning work in process inventory + (direct material used + direct labor incurred + manufacturing overhead) – ending work in process inventory

Schedule 2- Schedule of cost of goods manufactured

Work in process inventory January 1, 2018	110,000.00
Add: Direct Materials used* (previous schedule)	448,150.00
Direct labor	437,500.00
Factory overhead	237,700.00
Manufacturing cost incurred during the year	1,123,350.00
Total work in process inventory during the year	1,233,350.00
Deduct: Work in process inventory December 31, 2018	131,600.00
Cost of goods manufactured	**1,101,750.00**

Step 3 – The schedule of cost of goods sold

The cost of goods sold represents the cost of goods that are sold during a given year. The cost of goods sold is computed using the following formula:

Cost of goods sold = Beginning finished good inventory + cost of goods manufactured – ending finished good inventory

Assume that the finished good inventory as of the beginning of the year is Birr 157,000.00, and the ending inventory of finished good inventory is Birr 182,000.00. The cost of goods sold is then prepared as follows:

Schedule 3 – schedule of cost of goods sold

Finished goods inventory, January 1, 2018	157,000.00
Add: Cost of goods manufactured*	1,101,750.00

Cost of goods available for sale	1,258,750.00
Deduct: finished good inventory December 31, 2018	182,000.00
Cost of goods sold	**1,076,750.00**

* The cost of goods manufactured is obtained from the previous schedule.

Step 4 – The income statement

All the above schedules are inputs one to the other. The ultimate goal of making all the schedules is to prepare the income statement. The income statement contains three main elements, and these are: Sales, Cost of goods sold, and Operational expenses.

The cost of goods sold is deducted from sales to arrive at gross profit or gross margin. From the gross margin, operational expenses are deducted to determine net income assuming no income tax.

Schedule 4 – schedule of the income statement

The income statement of Alder Furniture Factory looks the following

Sales		1,831,600.00
Cost of goods sold:		1,076,750.00
Gross profit		754,850.00
Operating expenses:		
Selling expenses	330,000.00	
Administrative expenses	168,850.00	
Total operating expenses		498,850.00
Net income		256,000.00

The above income statement is called a single step or condensed income statement, as it does not show how each element is constructed. The separate schedules are inputs to the income statement. It is also possible to include all the schedules at a time to prepare the income statement. Such a statement contains detailed information about each item. Such a statement is called multiple step income statement. The statement in the following page is a multiple step income statement of ALDER Furniture Factory.

ALDER Furniture Factory

Income statement

For the year ended, December 31, 2018

Sales		1,831,600.00
Less cost of goods sold:		
Finished goods inventory, January 1, 2018	157,000.00	
Work in process inventory, January 1, 2018	110,000.00	
Work in process during the year:		
Direct materials used:		
Direct materials, January 1, 2018	124,000.00	
Direct materials purchased (including freight in)	441,600.00	
Direct materials available for use	565,600.00	
Direct materials, December 31, 2018	117,450.00	
Direct material used	448,150.00	
Direct labor	437,500.00	
Factory overhead:		
Indirect labor	98,600.00	
Depreciation on factory equipment	44,600.00	
Light and power	43,600.00	
Depreciation of Factory building	12,000.00	
Insurance expense on factory properties	9,500.00	
Property tax	19,500.00	
Factory supplies expense	5,800.00	
Miscellaneous factory costs	4,100.00	
Total Factory Overhead	237,700.00	

Total manufacturing cost during the year	1,123,350.00
Total work in process during the year	1,233,350.00
Deduct: Work in process, December 31, 2018	131,600
Cost of goods manufactured	1,101,750.00
Cost of goods available for sale	1,259,250.00
Deduct: Finished good inventory, December 31, 2018	182,000.00
Cost of goods sold	1,076,750.00
Gross profit	754,850.00
Deduct: Operational expenses:	
Selling expenses	330,000.00
Administrative expenses	168,850.00
Total operational expenses	498,850.00
Net income	256,000.00

2.7. Chapter Summary

Accounting systems should serve multiple decision purposes, and there are different measures of cost for different purposes. The most economically feasible approach to designing a management accounting system is to assume some common wants favorite of decisions and choose cost objects for routine data accumulation in light of these wants.

The chapter has concentrated on definitions and explanations of many widely used cost accounting terms. The most basic distinction is between direct and indirect costs. The same cost may be direct regarding one cost object and indirect regarding other cost objects. This unit has merely linked the vast number of classification of costs that have proved useful for various purposes.

2.8. Self-Test Questions

Now, before proceeding to the next chapter, attempt the following questions:

Part I: Choice the best answer

1. In a manufacturing business enterprise, costs of the goods manufactured include:
    A. Costs of direct materials
    B. Manufacturing overhead costs
    C. Direct labor costs
    D. All of the above
    E. None of the above
2. The operating cycle that best describes the transfer of raw materials to the factory from stores and the application of labor and other factory facilities to complete the manufacturing process of the product is known as:
    A. Ware housing
    B. Selling
    C. Procurement
    D. Production
    E. None
3. Which of the following is not classified under factory overhead cost?
    A. packing materials costs
    B. Lubricants' cost for factory operations
    C. Office supplies costs
    D. Factory line supervisors costs
    E. None of the above
4. One of the following costs represents non-manufacturing costs
    A. Sales salaries
    B. Insurance expenses on factory equipment & machinery
    C. Daily wages expenses of factory workers
    D. Heat, light and power consumption to operate the factory
    E. None of the above

5. One of the major functions of Cost Accounting is supplying enough information to management to achieve the greatest efficiency and profit under competitive conditions. Which of the following questions might be answers by cost Accounting?
    A. Is our plant operating efficiently and economically?
    B. Which of our costs are out of line and how can they be controlled?
    C. Are our sales prices set realistically in relation to costs?
    D. All of the above

E. None of the above

Answer Question No 6, 7 and 8 based on the following information obtained from cost Account section of Awash Manufacturing enterprise.

The following costs were incurred during the month of December.

Direct materials used ---------Br 206,180
Direct labor cost----------Br.341,220
Depn Factory plant assets ----Br.60,000
Indirect materials used --------Br. 40,000
Indirect labor cost---------- Br30,000

6. What were the **prime costs** of the month of December?
    A. Br 341,220
    B. Br 336,180
    C. Br. 547,400
    D. Br 206,180
    E. None
7. What were the **conversion costs**?
    A. Br.416,800
    B. Br 336,180
    C. Br. 547,400
    D. Br 341,220
    E. None
8. What were the total manufacturing costs for the month?
    A. Br. 677,400

B. B. Br 753,580

C. Br. 336,180

D. Br. 547,400

E. None

9. If 2,000 units (finished goods) of an item is produced using direct material cost of Br. 10,000; direct labor cost of Br. 30,000 and overhead is applied at a rate of 2 times the direct labor cost. The unit cost of producing this item is:

   A. Br. 5

   B. Br. 20

   C. Br. 50

   D. None of the above

10. ABC Manufacturing Company has the following cost data:

    Direct materials: Beginning bal. ----------Br 10,000

    Net materials purchases…… 15,000

    Ending materials Balance -----5,000

If Direct labor cost is 50% of direct materials used; and overhead is 150% of direct labor costs used, then the total costs of production will be:

A. Br. 40,000 B) Br. 45,000 C, Br. 30,000 D. Br 20,000 E. None

Part II. Answer the following questions in your own words

1. Do service sector companies have inventoriable costs? Explain

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2. Why do managers consider direct costs to be more accurate than indirect costs?

---

3. Describe the different categories of inventories commonly found in manufacturing companies.

---

4. Explain the purpose of cost information in the management functions?

---

5. What are the three basic elements of manufacturing cost of a product?

---

6. Distinguish between cost and expense.

-

Part III : work out questions

1. Foxwood ***Company accumulated the following data for 2007***.

	Jan 1, 2007	**Dec 31, 2007**
Inventories:		
Finished Goods	$ 52,000	$ 54,000
Work in Process	29,600	27,800
Raw materials	14,200	15,000
Direct labor		95,000
Raw material purchases		138,000
Indirect labor		15,300
Indirect materials and supplies		10,800
Factory utilities		18,600
Depreciation expense- Factory		14,000
Factory rent		18,000
Payroll taxes- Factory wages		8,100
Repairs and maintenance-Factory		6,000
Insurance expense- Factory		6,800
Miscellaneous factory expenses		5,200

Sales	710,000
Sales discount	12,000
Selling expenses	95,600
General expenses	75,300
Interest expenses	7,000

Required:

a) Prepare a statement of cost of goods manufactured.

b) Prepare an income statement (assume an income tax rate of 25%)

2. Consider the following account balance for ABC manufacturing company in the year 2004.

	Beginning balance	End balance
Direct material inventory	$22,000	$26,000
WIP inventory	21,000	20,000
Finished goods inventory	18,000	23,000
Purchase of direct material		75,000
Direct labor cost		25,000
Indirect labor cost		15,000
Plant insurance		4,000
Insurance- administrative		5,000
Depreciation - plant building and equipment		9,000
Depreciation - administrative building		3,000
Repair and maintenance – factory equipment		4,000
Marketing, distribution and customer service cost		93,000
General and administrative cost		29,000

Required

a) Calculate cost of direct material used

b) Calculate cost of goods manufactured

c) Calculate cost of goods sold

d) If revenue for the year is $300, 000, prepare income statement for the Company.

CHAPTER THREE: JOB, PROCESS AND OPERATION COSTING

Dear students! Do you know how do organizations choose among costing systems? Good! Don't worry we will get the answer from the following discussion. Management depends on relevant and reliable information about costs in managing their organizations. The role of management accountant is to develop management information systems that provide managers with the cost information they need. Management need extensive information about product related costs.

Learning objectives:

Dear students, after completing this chapter you should be able to:

- ☞ Explain the purpose of cost allocation
- ☞ Explain basic types of product costing systems
- ☞ Demonstrate the accounting processes for materials costs, labor costs and manufacturing overhead costs and identify documents and records used
- ☞ Define job order and process costing systems and identify the situations in which each costing systems are appropriate
- ☞ Define and use the concept of an equivalent unit

3.1. Concepts: Costing System, Cost Pool and Cost Allocation Bases

A costing system constitutes one of the most important elements of the managerial information system. Its presence enables the organization to meet three objectives. First, it enables the organization to effect managerial control. Without a costing system, organizations would not be able to make managers at all levels accountable for the costs of the resources they consume and identify whether they have been used efficiently and effectively. Second, cost information is an important element of the planning and decision-making process. Businesses develop, produce and market products and services. Identifying which products and services to bring to market would not be possible without a product costing system. Third, most organizations are legally bound to provide reports to external parties. The costing system serves to facilitate this legal requirement.

There are three main types of cost accounting systems for product costing: Job order, process and operational cost systems.

(a) Job order costing system: A job order costing system is a product costing system used by both manufacturing companies and service organizations that make large, unique, or special order products such as customized publications, specially built cabinets, custom printing business etc. Under such a system, the costs of direct materials, direct labor, and manufacturing overhead is traced to a specific job order or a batch of products. A job order is a customer order for a specific number of specially designed, made to order products. Job order costing measures the cost of each complete unit. It uses one work in process inventory account to summarize the cost of all jobs. This account is supported by job order cost cards or a subsidiary ledger of accounts for each job.

(b) Process costing system: A process costing system is a product costing system used by companies that produce large amounts of similar products or liquids, or that have a continuous production flow. Makers of paint, soft drinks, bricks, milk or paper would use a process costing system. Under such a system the cost of direct materials, direct labor and manufacturing overhead are first traced to processes, departments, or work cells and then assigned to the products manufactured by those processes, departments or work cells. A process costing system uses several works in process inventory accounts, one for each process, department or work cell.

(c) Operational costing system: In reality, few actual production processes perfectly match either a job order costing system or a process costing system. This typical product costing system combines parts of both job order costing and process costing to create a hybrid system designed specifically when companies produce large batches of similar products in which significantly different types of materials are use. An example of a company that would use an operational cost system is an automobile manufacturer. An automobile Maker may use process costing to treat the costs of manufacturing basic car and then use job order costing

to track the costs of customized features such as a convertible or hardtop, an automatic transmission or stick shift.

Cost allocation refers to the assignment of all indirect costs to a cost object using an allocation base. The ultimate goal of cost allocation is to make certain that all costs incurred by the organization eventually are assigned to its products or services. This is important for several purposes including cost based pricing, bidding, cost reimbursement from outside parties like insurance companies, valuation of inventory, determination of income and all other economic decisions. Besides, the allocation of all costs to departments serves to make departmental managers aware of the cost incurred to produce services their departments use. Costs that are incurred by a certain common facility in serving different users must be allocated to the users based on certain reasonable method. In the previous chapters of this module, we have discussed the basic concepts of cost accounting and terms which are commonly used and helpful in cost accounting either in allocating or generally tracing of costs to accost object.

As we have already discussed in unit two of this module, product cost elements are broadly classified into three: They are Direct material cost, Direct labor cost and all indirect manufacturing cost (i.e. manufacturing overhead). They are also called as Inventoriable costs. Dear student, have you remembered this classification of costs? Well, let us proceed to the following discussion related to this topic and other related concept.

A direct cost is any cost that can be conveniently and economically traced to a specific cost objective. Direct materials and Direct- labor costs are referred as direct cost.

An indirect cost is any cost that cannot be conveniently or economically traced to a specific cost objective. Any production cost not classified, as a direct cost is an indirect cost. An indirect cost or manufacturing overhead is to be properly classified, accounted and assigned to cost objective or product. Improper accounting, classification and assigning of indirect cost leads to overstatement or understatement of product cost. If the product cost is overstated the concern will loose the bid since the price charged is much more than competitor’s price.

On the other hand, when the cost of product is understated, the overall profitability is decreased or some times incurring heavy losses. Hence, the manufacturing overhead is to be properly and correctly assigned to the products. Under this unit, our main focus is on the proper classification and assignment of indirect costs and the methods used to allocate the indirect costs.

Cost Allocation: the process of assigning or applying collected indirect costs to cost objects using an allocation base is known as cost allocation. Dear student, to know the cost allocation the following terms are to be known and they have strong tie with the allocation of costs to products or services. These are:

- Cost object
- Cost pool and
- Cost driver

Cost object: - is the destination of all assigned or allocated costs. For example, a cost may be assigned to a particular product, service or department. For purposes of product costing, cost allocation is the assignment of manufacturing overhead costs to the product (cost object) during the accounting period.

Cost pool: *is* a collection of overhead costs related to a cost object (a product related activity).

Cost driver: is an activity that causes the cost pool to change (increase/decrease) in amount as the cost driver changes (increase/decrease) in volume,

Cost allocation requires.

- the pooling of manufacturing overhead costs that are affected by a common activity and
- the selection of a cost driver whose activity level causes a change in the cost pool.

3.2. Job Order Costing System

To properly account product cost, a company must use an Accounting system that accumulates and assigns costs to the manufactured units. Proper accounting for products

is particularly essential in the preparation of financial statements as costs that are assigned to goods sold appear on the Income statement and costs assigned to the unsold units appear on the balance sheet.

Activity:
Question1: Differentiate the three costing system and Elaborate the basic characteristics of job costing?_____

3.2.1. Cost Accounting System

The cost accounting system uses the perpetual inventory system, and achieves greater accuracy in the determination of product costs than is possible with the general accounting system. It also permits far more effective control by supplying data on costs incurred by each manufacturing department or process and it provides a fairly accurate unit cost of manufacturing each type of product that helps managers make good decisions timely.

There are two extremes of cost accounting systems for manufacturing operations – job order cost system, and process cost system. A job order cost system provides a separate record of the cost of each particular quantity of product that passes through the factory. The system accumulates costs for a particular batch of production, commonly referred as a Job. A job has a definite starting and completion time as would, for example, the production of 10 pieces of windows, or 50 coffee tables. In job order costing system, costs are accumulated by job. For each job, the firm maintains a separate job cost sheet, which is a record on which manufacturing costs of the job are accumulated.

Job order costing for manufacturing firms:

An interrelationship exists between the physical flow of production, and the cost accounting cycle. The flow of costs parallels the flow of work in the production settings.

Work and cost flow in job order costing cycle

The physical flow of production is the sequence of operating activity that begins with the decision to order direct materials and ends with finished product being sold to customers.

The intervening steps may vary from firm to firm, but they share a common thread. The following may show the steps of the physical flow of production.

a. A decision is made to order basic direct materials. Specialized direct materials may be ordered as needed. The store room clerk fills a purchase requisition form when the basic input has reached some point which is commonly called as the reorder point. The reorder point is the point where the stock level has reached the allowable minimum amount. The manufacturer does not allow stock levels below that to avoid stock out situations because of unexpectedly high use of direct materials.
b. Direct materials and supplies are ordered from vendors.
c. Direct materials are received and placed in the store room.
d. A decision is made to manufacture a specific product.
e. Direct materials and supplies are issued from the store room and placed into production.
f. Direct labor employees work on transforming the direct materials into work in process/
g. Other indirect and common costs are incurred in the process of transforming the direct materials into work in process.
h. The work in process is completed and becomes finished goods.
i. The finished goods are sold and become cost of goods sold.

1. **Purchase requisition** – For commonly used direct materials, organizations have a reorder level, which is the minimum amount of stock that can be on hand at any given time before another purchase is made to meet the lead time demand. The reason for maintaining such a minimum stock level is to hedge against the risk of stock shortages due to reasons like unexpected heavy usage, delays and other reason that results in stock out situations. When the stock level reaches such a point, the storeroom clerk fills a purchase requisition, a form requesting the purchase of the needed material. After the form is duly filled, it will be sent to the purchasing department.

A purchase requisition form contains the following information:

- The date the form is prepared.
- A description of the direct material required.
- The quantity of the material in question.
- The date when the material is required.
- The requisition number.

A sample of purchase requisition form looks like the one on the next page:

ALDER Furniture Factory Date January 5, 2018 Requisition no. 121		
Purchase requisition form Prepared by:		
Quantity	Description	Date needed
1,000.00 board ft	Lumber (eucalyptus)	January 15, 2018
5 gallons	Glue	January 15, 2018
50 boxes	Nails	January 15, 2018

Specialized items may be requested by a central scheduling department or the department in need of the particular input. No journal entry is required when a purchase requisition is prepared.

2. **Purchase order** – the purchasing department following purchase requisitions from the storeroom clerk will prepare a purchase order. A purchase order is a document that authorizes the supplier to ship the specified merchandise ordered. A typical purchase order may contain the following:

a. The name of the company giving the order
b. A purchase order number.
c. The date of the purchase order.
d. The requisition number.
e. The name of the supplier and address.
f. The quantity and description of the material.

g. The delivery date.

h. The price and terms of payment.

i. Transportation terms.

A sample purchase order looks the following:

ALDER Furniture Factory Purchase order form Date January 6, 2018			Purchase No. 496	
Vendor Gentle lumber processing Sihn Close to Piazza				
F.O.B point	Ship Via	Terms	Delivery date	Requisition no.
Factory site	Tana Transport PLC	2/10, n/30	Jan. 15, 2018	121
Item no.	Quantity	Description	Unit price	Total
1.	1,000 board ft.	Lumber (eucalyptus)	20	20,000.00

No journal entry is required when a purchase order is filled.

3. **Receiving report –** when the ordered materials are received, the receiving department prepares a receiving report, which lists the description, and quantities of goods received. A copy of the document will be sent to the storeroom clerk along with the materials. The receiving report, together with the invoice of the supplier forms the basis for recording the purchase of the materials. The purchase of the lumber in the above example, for instance, would be as follows:

		Dr.	Cr.
January 15, 2018	Direct material	20,000.00	
	Account payable		20,000.00

Had several types of direct materials been purchased, the entry requires posting to the general ledger control account and the subsidiary ledgers for each class of material.

A sample receiving report is shown below.

<table>
<tr><td colspan="4">ALDER Furniture Factory
Receiving report form</td></tr>
<tr><td colspan="2">Received from:
Gentle lumber processing Sihn
Close to Piazza</td><td colspan="2">Receiving report No. R 1345</td></tr>
<tr><td colspan="2">Freight:
Pd [X] Collect [ ]</td><td colspan="2">Purchase order No. 496</td></tr>
<tr><td colspan="2">Date received: February 15, 2018</td><td colspan="2">Received by: Tsega G.</td></tr>
<tr><td rowspan="2">Quantity</td><td rowspan="2">Description</td><td colspan="2">Weight</td></tr>
<tr><td>Gross</td><td>Net</td></tr>
<tr><td>1,000 board ft.</td><td>Lumber (eucalyptus)</td><td></td><td></td></tr>
</table>

4. **Production order –** a manufacturer can produce in response to a customer order or just for stock. Whatsoever, when the decision to produce is made, productions order will be prepared and approved by the manager in charge. A typical production order may contain the following commonly:
    - A description of the product to be manufactured
    - The quantity required
    - The estimated date of completion
    - A job order no.
    - The date of the production order
    - The authorization signature

No journal entries are required on the company's books when the production order is issued. A sample production order is presented as follows.

ALDER Furniture Factory Production Order		
Date: January 19, 2018		Job No. 365
Manufactured for: Stock		
Date needed: March 20, 2018		
Quantity	Model number	Description
150	F. 4152	Coffee table
Authorized by: Dereje Demissie		

5. **Material requisition –** to commence production, evidently the production department needs direct materials. The materials required for production are requested through a document called material requisition form. The material requisition form should contain specific description of the direct and indirect materials required for production. A typical material requisition form contain:
   - The job number for which the material is required
   - A description of the direct materials and supplies needed
   - The quantity of each direct materials and supply needed
   - The unit cost of each material
   - The total cost
   - Classification into direct and indirect material.

A sample material requisition form is shown below:

Material requisition No. 906			Date: January 28, 2018	
Job No. to be charged: 365				
Quantity	Description	Unit cost	Total cost	Classification
500 board ft.	Lumber	20	10,000.00	Direct
1 box	Nail	22	22	Indirect
1 Gallon	Glue	30	30	Indirect
			10,052.00	
Authorized signature		Direct materials -------10,000.00 Indirect materials ----------52.00		

At the time the materials are issued from the storeroom, the following entry is made:

Jan. 28, 2018	Work in process	10,000.00	
	Manufacturing over head	52.00	
	Direct material and supplies		10,052.00

Direct materials that are sent for manufacturing process are no more direct materials since they are soon to be processed to become finished good. Thus, the cost is charged to work in process account.

Right after the materials are received from store, a job cost sheet will be prepared. The job cost sheet is used to accumulate the manufacturing costs incurred in producing that particular job. It maintains the break down of the manufacturing costs, direct materials, direct labor, and manufacturing over head. The total costs then divided by the units produced to determine the unit cost of each item produced. The second importance of job cost sheet is that it acts a subsidiary ledger to the work in process account in the general ledger. A separate cost sheet is maintained for each job. Thus, the value of work in process at any time can be found by adding the different job cost sheet. The following is a sample job cost sheet:

Job Cost sheet									
Job No. 365					Date started: Jan. 29, 2018 Date completed: March 20, 2018				
Item 4152 – coffee tables For stock									
Direct material			Direct labor			Manufacturing overhead			
Date	Req. No.	Amount	Date	Hours	Amount	Date	DLH	Rate	Amount
Jan. 28 2018	906	10,000							
Cost summary									
Cost item					**Amount**				
Total direct material									
Total direct labor									
Total manufacturing overhead applied									
Shipping summary									
Date	Number of units shipped				Cost balance				

6. **Job time ticket –** the second cost category of manufacturing firms is the direct labor employed. A job time ticket is used to record how much time is spent on a particular job. When a particular job is started, the employee fills the time the job is started on the job time ticket, and he punch out the card and fills the time he stopped when he left the job. Suppose analysis of the job time ticket showed direct labor of 9,600.00 and indirect labor of 4,800.00, the journal entry to record the cost of direct and indirect labor looks the following:

Jan. 28, 2018	Work in process	9,600.00	
	Manufacturing over head	4,800.00	
	Wages payable		14,400.00

A sample of job time ticket is shown below

Job time ticket			
Employee's Name:		Date: March 5	
Department: Sanding		Time started: 8:30 am Time completed: 11:30	
Operation: Sanding		Job no. 365	
Hours	Rate of pay	Direct labor	Comment
3 hrs.	8	24	

Idle time may exist because of machine breakdown, or when there is material shortage or time lost while the employee shifts from one job to another. The cost of idle time should be absorbed by all units produced in the year instead of cost of a specified product. Thus, cost of idle time is debited to overhead.

7. **Manufacturing overhead –** costs other than direct material and direct labor that are necessary to transform the raw materials into finished goods are called manufacturing over head. Such costs include factory rent, electricity, and depreciation on machinery. Most of these costs are common to more than one batch of job and hence cannot be directly traced to a specific job. Thus, such costs must be assigned to the different cost objects in some way. The other problem if

actual overhead is used, the cost of units produced in some months unduly absorbs huge costs and thereby increasing unit cost. For instance, during February a manufacturer produced 500 coffee tables and only 100 coffee tables are produced in the month of August. Suppose manufacturing overhead of Birr 30,000 is incurred in both months. Assume that the direct material and direct labor per unit totaled Birr 108. The unit overhead cost becomes Birr 60 for those units that are produced in February, and the total cost of a single unit becomes 168. However, the unit overhead cost for those coffee tables produced in August is Birr 300, which is greater than the February cost by 240.00. The unit cost of a single coffee table produced in August will also be Birr 408.00. The same products are charged very different amount if the actual overhead is used. Another problem with actual overhead is that suppose that maintenance costs of 30,000.00 is incurred in the month of August in addition to the previous amount. Under the circumstance, the unit overhead cost is going to be even more, which is 600 per unit. Thus, it is essential to charge the total cost of manufacturing overhead through out the year to all units produced in that period. However, this amount can only be known at the end of the year, which in turn means that the organization has to wait until the accounting year ends to determine the actual overhead cost. Most probably, many of the jobs are completed before the year ends, and thus, the accounts are left open until the actual amount is known. The accounting information obtained after the year ends though accurate, it is irrelevant since it is untimely. The major limitation that the firm could not identify the cost of its product which in turn prohibiting the preparation of interim financial statements that management uses to control operations. Therefore, it is important to estimate the cost in advance and apply to each job using some allocation bases.

A predetermined overhead rate is calculated using the projected overhead cost and some activity base that has a cause and effect relationship with manufacturing overhead costs. For instance, assume that the projected overhead cost for the

upcoming year is Birr 80,000.00, and the direct labor hour is estimated to be 4,000 hrs, the predetermined overhead rate can thus be calculated as follows:

$$\textbf{Predetermined overhead cost} = \frac{\textbf{Estimated overhead cost}}{\textbf{Estimated activity base (direct labor hr.)}}$$

$$\textbf{POR} = \frac{\textbf{80,000}}{\textbf{4,000}} = \textbf{20 per direct labor hour.}$$

If we assume that the direct labor hours spent on the job are 90, the manufacturing over head applied will therefore be 90 X 20 =600. The entry to record the manufacturing overhead applied is as follows:

March 18, 2018	Work in process	1,800.00	
	Manufacturing overhead applied		1,800.00

The manufacturing overhead applied is a contra account to the actual manufacturing cost. More on this later.

Although actual costs are not assigned, they should be recorded as incurred. Suppose that factory rent, utilities, and other manufacturing costs totaled Birr 22,000.00. The following entry is required to record the actual manufacturing cost.

March 20, 2018	Manufacturing over head	22,000.00	
	Various accounts		22,000.00

8. **Finished good inventory ledger card –** when work in process is completed and transferred to the finished good inventory warehouse, the following journal entry is required:

March 20, 2018	Finished goods	21,400.00	
	Work in process		21,400.00

9. **Cost of goods sold –** two records are maintained when sale is made under the perpetual inventory system: one for sales and the other for cost of goods sold. Assume that half of the coffee tables produced are sold for birr 180 each on with a 40% down payment. The entry to record the sales looks the following:

April 10, 2018	Cash	5,400.00	
	Account receivable	8,100.00	
	Sales		13,500.00

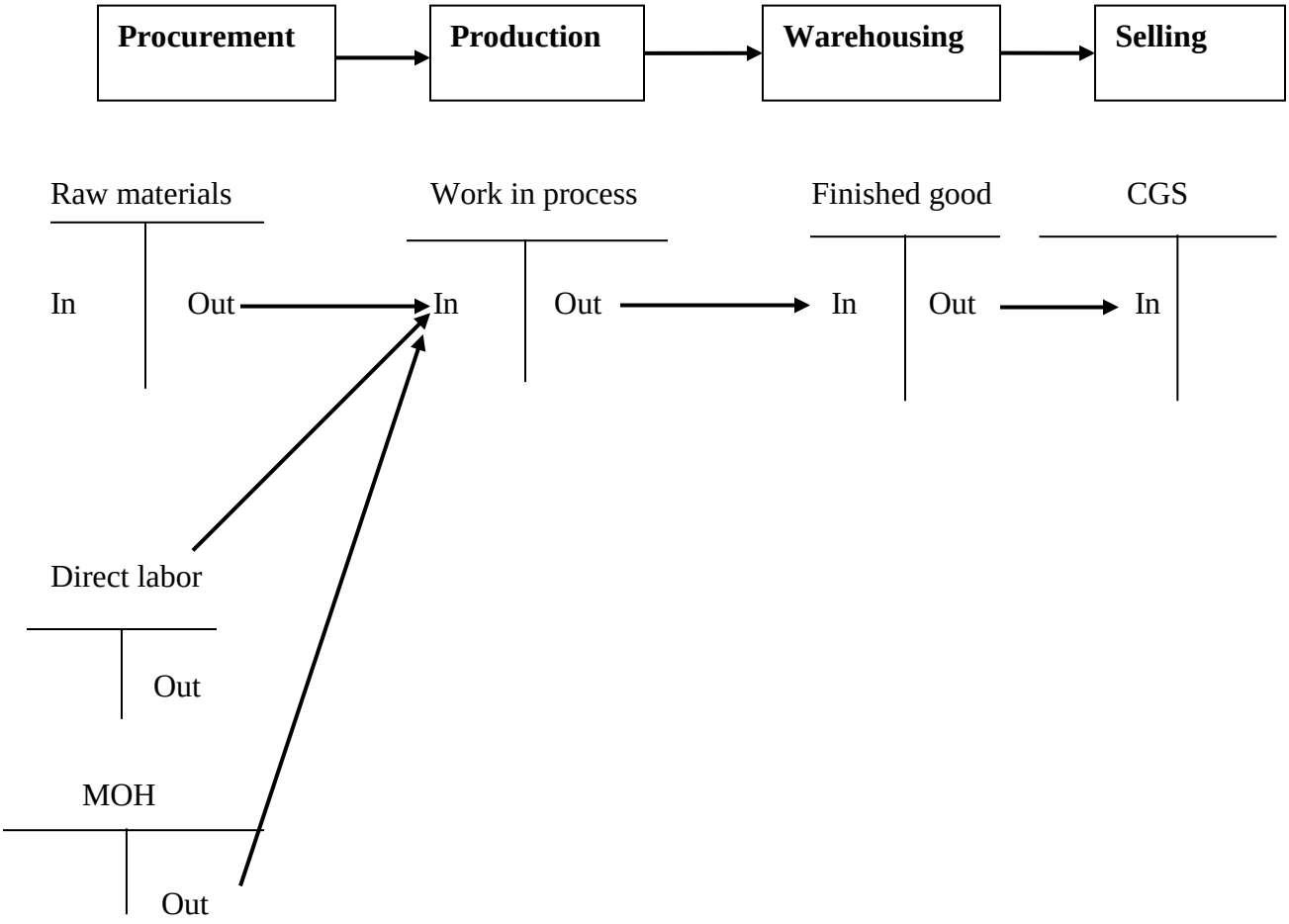
The total units produced are 150 as shown in the production order. Half of that amount is 75, and 75 units at 180 is equal to 13,500.00. When we come to the cost of goods sold, the total cost of goods produced is Birr 21,400.00. Thus, the unit cost of each coffee table is Birr 142.67. The cost of the 75 units that are sold is Birr 10,700.00. The following entry is necessary to record the cost of goods sold.

April 10, 2018	Cost of goods sold	10,700.00	
	Finished goods		10,700.00

In general, a firm's cost accounting system parallels its flow of operation. The nine steps followed in the previous illustration are summarized below in a concise manner.

1. Procurement – raw materials and supplies needed for manufacturing are ordered, received, and stored.
2. Production – raw materials are transferred from storeroom to factory. Labor, tools, machines, power, and other costs are applied to transform the raw material into finished product.
3. Warehousing – finished goods are moved from the factory to the ware house to be held until they are sold.
4. Selling – customers are found. Merchandises are shipped from the warehouse, and customer accounts are charged.

The following diagram shows the above points:



As shown in the table cost flow parallels with the physical flow of production.

Manufacturing overhead

Manufacturing costs are common costs – costs shared by more than one cost object- that should be apportioned among the cost objects sharing the cost. However, the total overhead costs cannot be known exactly until the end of the year. Thus, organizations should wait up to the end of the year if they are to charge the actual amount. Yet, many jobs are completed but the job cost sheet remains open waiting for the actual overhead

cost. Thus, interim financial statements are impossible which in turn affect managerial decision purposes.

A predetermined overhead rate is determined to allocate such costs to individual jobs, which is found by dividing estimated overhead cost to the estimated amount of allocation base. The allocation base is assumed to be a cost driver of manufacturing overhead costs. In other words, there has to be a cause and effect relationship between the allocation base and manufacturing overhead costs. For instance, a labor intensive firm should use a labor oriented base, and a machine base should use a machine oriented base since most these overhead costs may respond to a change to the allocation base.

A firm can use one of several allocation bases and the choice depends on the nature of the manufacturing operations. The most commonly used allocation bases are (1) direct labor cost (2) Direct labor hour (3) machine hours (4) materials cost, and (5) prime costs. For illustration purposes, ALDER Furniture Factory estimated the following for the upcoming period.

Manufacturing over head cost	675,000.00
Direct labor cost	450,000.00
Direct labor hour	90,000.00
Machine hour	45,000.00
Direct material cost	225,000.00

Direct labor base – when the direct labor base is used as an allocation base, the estimated allocation base will be used as a denominator and the estimated overhead cost will be used as a numerator.

Predetermined overhead rate = Estimated Manufacturing over head

Estimated direct labor cost

POR = 675,000/450,000 = 1.5 or 150%

The applied overhead is150% of the direct labor cost of the job. The direct labor cost is the most popular and widely used by labor-intensive firms. The direct labor cost can

readily be found from the payroll records. However, the direct labor cost suffers from serious limitation when the wage rate differs from employee to employee.

Assume that Employee A and B works in the same organization but Mr. A earns Birr 5 per hour, and B earns Birr 10 per hour. Both have worked for 40 hours. Both work similar jobs; A work Job no. 452 and B works job no. 453. Assume the company allocates manufacturing costs at 150% of direct labor cost. The assignment looks the following:

	Employee A	**Employee B**
Salary for 40 hrs.	40 X 5 = 200	40 X 10 = 400
	Job No. 452	**Job No. 453**
Manufacturing overhead applied	150% X 200 = 300.00	150% X 400 = 600

When there is a significant difference in the hourly rate of employees, the direct labor cost produces a weak result. Under such circumstance, direct labor hour is the best alternative. Given the assumptions above, the predetermined overhead rate is calculated as follows for direct labor:

POR = Estimated manufacturing overhead cost = 675,000.00 = 7.50per hour

Estimated direct labor hour 90,000.00

Taking the above example,

	Employee A	**Employee B**
Hrs. worked	40	40
	Job No. 452	**Job No. 453**
Manufacturing overhead applied	40 X 7.50 = 300	40 X 7.50 = 300

The direct labor hr. is important in that it is unaffected by the difference in hourly wage rate. It effectively works when the hourly wage rate is uniform or different. The limitation is that the administration cost is high.

Machine hours are important bases to apply overhead when the factory is machine intensive. The accounting treatment is almost the same. The predetermined overhead rate is calculated as:

POR = Estimated manufacturing overhead = 675,000.00 = 15 per machine hour
Estimated machine hours 45,000.00

Machine intensive firms are apt to use machine hours at apply manufacturing overhead costs to jobs. The problem is that figures on machine hours are not readily available. Suppose that machine hours spend on Job 452 and Job 453 is 20, and 22 respectively. The manufacturing overhead to be applied to both jobs is as follows:

	Job No. 452	**Job No. 453**
Machine hr.	20	20
Manufacturing overhead applied	20 X 15 = 300	22 X 15.00 = 330

Cost of materials is another alternative to apply manufacturing overhead to jobs. The estimated direct material costs are used as a denominator to determine the predetermined overhead rate. The predetermined overhead rate can be calculated in the following manner for ALDER Furniture Factory.

POR = Estimated manufacturing overhead = 675,000.00 = 300% of material cost
Estimated material cost 225,000.00

Suppose that Job 452 consumed direct material cost of 110, and Job 453 consumed direct material cost of 120. The manufacturing overhead applied to each job is:

	Job No. 452	**Job No. 453**
Material cost	110	120
Manufacturing overhead applied	110 X 300% = 330	120 X 300% = 360

This method is the least used because very few manufacturing costs are a function of the cost of direct materials used in production.

Prime costs can also be used as an allocation base to apply manufacturing overhead. Prime cost is the combination of direct material and direct labor used in the production

process. The **POR** determination for ALDER Furniture Factory using prime costs as an allocation base is shown below:

POR = Estimated manufacturing overhead = 675,000.00 = 100% of prime cost

Estimated prime cost 675,000.00

The amount to be applied to Job no. 452 and Job no. 453 assuming prime cost of 320 for each, the application of estimated manufacturing overhead looks the following:

	Job No. 452	**Job No. 453**
Prime cost	320	320
Manufacturing overhead applied	320 X 100% = 320	320 X 100% = 320

Prime cost as an allocation suffers the same limitation of direct material and direct labor cost.

Illustration 2 - Job order costing

To illustrate the procedures used to accumulate and assign costs to a job in job order costing system, assume that ALDER Furniture Factory has three jobs in the coming year – Job no. 555, Job no. 556, and Job no. 557. Job No. 555 is a job order received from Wollo University for 1,000 student chairs, and Job no. 556 is production of 30 coffee tables for stock, and Job no. 557 is production of 20 cupboards for stock. To keep the illustration simple, assume there is no beginning inventory of, work in process, and finished good.

1. The beginning inventory of direct materials consisted of:
    - Material A----------22,400.00
    - Material B----------15,600.00
    - Material C----------21,000.00

      Total ----------59,000.00
2. Direct materials amounting to 124,000.00 are purchased on January 26 from Tadu Wood Processing, terms 2/10, n/60. The details are:
    - Material A---------- 2,000.00
    - Material B----------32,000.00

- Material C----------80,000.00
- Material D ---------- 4,000.00

Total ----------118, 000.00

The following journal entry is required to record the purchase:

	Debit	Credit
Direct materials, and supplies - control	124,000.00	
Account payable		124,000.00

The direct materials and supplies account is a controlling account of the three types of direct materials, A, B, and C. The individual items will be posted to their respective subsidiary ledger.

3. Production is to commence and the following materials are issued:
    - Material B---------- 20,000.00
    - Material C---------- 12,000.00

The issuance of direct materials is a change that needs to be recorded.

	Debit	Credit
Work in process	32,000.00	
Direct materials and supplies –control		32,000.00

Know a separate Job cost sheet is needed to accumulate cost of each job. Assume from the total materials, the three jobs are to be charged in the following way:

- Job 555---------- 12,800.00
- Job 556----------6,400.00
- Job 557 ----------12,800.00

Total----------32,000.00

Job Cost sheet	
Job No. 555	Date started: Jan. 29, 2018 Date completed: February 20, 2018
Item 4154 – student chair For: Customer Wollo University	

Direct material			Direct labor			Manufacturing overhead			
Date	Req. No.	Amount	Date	Hrs.	Amount	Date	DLC	Rate	Amt.
Jan. 28 2018	906	12,800.00	Jan. 31 2018	100	2,000.00	Feb. 28 2018	13,200	.7	9,240
Feb.14 2018	909	24,000.00	Feb. 28 2018	560	11,200.00				

Job Cost sheet									
Job No. 556			Date started: Jan. 29, 2018 Date completed: February 12, 2018						
Item 4152 – Coffee tables For stock									
Direct material			Direct labor			Manufacturing overhead			
Date	Req. No.	Amount	Date	Hrs.	Amount	Date	DLC	Rate	Amt.
Jan. 28 2018	906	6,400.00	Jan. 31 2018	50	1,000.00	Feb. 28 2018	6,600	.7	4,620
Feb. 14 2018	909	12,000.00	Feb. 28 2018	280	5,600.00				

Job Cost sheet									
Job No. 557			Date started: Jan. 29, 2018 Date completed: March 28, 2018						
Item 4152 – Cupboard For stock									
Direct material			Direct labor			Manufacturing overhead			
Date	Req. No.	Amount	Date	Hrs.	Amount	Date	DLC	Rate	Amt.

Jan. 28 2018	906	12,400.00	Jan. 31, 2018	100	2,000.00	Feb.28 2018	13,200	.7	9,240
Feb. 14 2018	909	24,000.00	Feb. 28 2018	560	11,200.00				

4. The total direct labor cost totaled 25,000.00, out of which 20,000.00 is indirect. The journal entry to record the payroll for the month is as follows:

	Debit	Credit
Work in process	5,000.00	
Manufacturing overhead	20,000.00	
Wages payable.		25,000.00

The total direct labor cost is to be charged to the three jobs in the following manner: Job no. 555 and Job no. 557 are to be charged 40% each, and Job no. 556 is charged 20%. The amount then filled on the job cost sheet (refer the job cost sheet).

5. Additional raw materials are issued amounting to Birr 78,000.00. The detail is shown below:
   - Direct material A ---------- 18,000.00
   - Direct material B ----------23,000.00
   - Direct material C----------31,000.00
   - Direct material D----------6,000.00

     Total ----------78,000.00

Out of the total 78,000.00, materials amounting to Birr 18,000 are indirect materials like glues. The journal entry to record the issuance of the direct and indirect materials issued looks the following:

	Debit	Credit
Work in process	60,000.00	
Manufacturing overhead	18,000.00	
Direct material and supplies- control		78,000.00

The three jobs are charged the 60,000.00 direct materials in the following manner:

- Job no. 555 ---------- 24,000.00
- Job no. 556---------- 12,000.00
- Job no. 557 ---------- 24,000.00

Thus, the job cost sheet is filled for the direct materials (refer the job cost sheet)

6. Indirect manufacturing costs incurred during the month totaled Birr 4,000.00. the journal entry to record the actual manufacturing overhead is as follows:

	Debit	Credit
Manufacturing overhead	4,000.00	
Sundry accounts		4,000.00

7. The payroll for the month of July totaled 48,000.00. The indirect labor cost is Birr 20,000. The direct labor cost is charged to the three Jobs – Job no. 555, Job no. 556, and Job no. 557 in 40%, 20%, and 40% respectively. The following journal entry is required to record the payroll for the month of February.

	Debit	Credit
Work in process	28,000.00	
Manufacturing overhead	18,000.00	
Wages payable		48,000.00

The job cost sheets will be charged in the percentage given above. Look at the job cost sheet.

Activity:
Question 2: Discuss how the direct labor and indirect labor used in production are recorded in manufacturing firm?_____

8. Manufacturing overhead is applied at 70% of direct labor cost. The following journal entry is required to record the manufacturing overhead applied to the three jobs.

	Debit	Credit
Work in process	23,100.00	
Manufacturing overhead applied		23,100.00
To record manufacturing overhead applied		

The manufacturing overhead applied will be charged to the three jobs in the following manner. Refer to the job cost sheet.

Jobs	**Direct labor cost**	**Overhead rate**	**Manufacturing overhead applied**
Job no. 555	13,200.00	70%	9,240.00
Job no. 556	6,600.00	70%	4,620.00
Job no. 557	13,200.00	70%	9,240.00

9. Other manufacturing cost for the month of February totaled 19,800.00. The journal entry to record the actual manufacturing overhead is as follows.

	Debit	Credit
Manufacturing overhead – control	19,800.00	
Sundry Accounts		19,800.00

10. Job no. 555 and Job 556 are completed and transferred to the finished good inventory warehouse. To record the transfer, the job cost sheet must be summarized. The summary of the two job cost sheets gives a total cost amount of Birr 59,240.00 and Birr 29,620.00 respectively. The journal entry to record the transfer looks the following:

	Debit	Credit
Finished good	88,860.00	
Work in process		88,860.00
To record the transfer of units completed		

Job 555 is for 1,000 Student chairs, and Job 556 is for 30 Coffee tables. Thus, the unit cost of each product is Birr 59.24 and 987.30 respectively. The following table shows the computation of unit cost of items produced.

	Job no. 555	**Job no. 556**
Total cost of production	59,240.00	29,620.00

Number of units produced	1,000	30
Cost per unit	59.24	987.30

11. St. Mary' College has paid Birr 85 per chair, and 5 coffee tables are sold for Birr 1,400.00 each during the month of February. The journal entry to record the sale of the Student chairs and coffee tables is follows:

	Debit	Credit
Cash	92,000.00	
Sales		92,000.00

Since a perpetual inventory system is used, a separate record is maintained for cost of goods sold. The journal entry to record the cost of goods sold is as follows:

	Debit	Credit
Cost of goods sold	64,176.5	
Finished good		64,176.5

The unfinished job, job no. 557 represents the work in process at the end of the month of February.

Activity:
Question 3: List out the procedures followed in job order costing system ?

3.2.2. Actual Costing versus Normal Costing

The use of an applied overhead instead of an actual overhead has the advantage of timeliness, and hence relevance for timely decision making. However, the amount may not be as accurate as the actual overhead cost. But the actual cost is known only at the end of the period, and thus product costing is impossible before the year ends. Actual costing thus makes product costing untimely, and this in turn affect decisions like product pricing, and controlling operations. Therefore, most firms use an applied overhead cost than actual cost for indirect manufacturing costs.

Normal costing is a costing system where the actual direct material and direct labor are added to the work in process inventory at the actual amount, and overhead costs are applied to the work in process inventory using a predetermined overhead rate. The term normal comes from the idea that the rate is normalized over a long period of time.

Actual costing is a costing system where direct material and direct labor costs are traced to the job at their actual amounts, and overhead costs are allocated using actual overhead. Since manufacturing overhead costs cannot be directly traced to each job in an economically feasible way, still the amount charged to each job is simply an allocated amount. The difference is simply the use of an actual overhead than an estimated overhead. Still the amount charged to each job does not represent the exact amount of what the job actually consumed. The accuracy in regard to the actual amount of overhead depends on the accuracy of the allocation base.

The table below shows summary of actual and normal costing

	Cost Assignment	**Actual costing**	**Normal costing**
Direct material	Tracing	Actual	Actual
Direct labor	Tracing	Actual	Actual
Manufacturing overhead	Allocation	Actual over head rate X actual cost driver used	Estimated overhead rate X actual amount of cost driver

3.2.3. Disposition of Over and Under Applied Overhead

Under normal costing, the actual amount of manufacturing overhead costs at the end of the period rarely matches with the applied manufacturing overhead costs during that same period. Often the applied amount may either be less or more than the actual amount. If the amount of manufacturing overhead is less than the actual amount, the difference is

said under applied overhead or under absorbed overhead. When the reverse is true, the difference is said over applied overhead or over absorbed overhead.

Under and over applied overhead at the end of one fiscal year should not be carried to the upcoming periods; rather they should be disposed off in the year the difference occurs. The disposition of under and over applied overhead costs can take one of the following two ways. One way of disposing the under applied or over applied overhead is to charge directly to cost of goods sold. Suppose that the manufacturing overhead – control has a debit balance of Birr 607,500, and the manufacturing costs applied is Birr 540,000. The under applied manufacturing overhead cost can thus be disposed to cost of goods sold in the following manner:

	Debit	Credit
Cost of goods sold	67,500.00	
Manufacturing over head applied	540,000.00	
Manufacturing overhead -control		607,500.00

The applied manufacturing overhead is a contra account to manufacturing overhead control, and thus, the normal balance for the applied manufacturing overhead is credit. At the end of the period both must be closed. The applied manufacturing overhead is debited and the manufacturing overhead is credited, and any difference is closed to cost of goods sold.

Under and over applied overhead costs can also be disposed off by prorating to work in process, finished good inventory and cost of goods sold. Assume the following information is pertaining to Awash Manufacturing Company:

	End of year balance before proration	**Manufacturing overhead allocated component of year-end-balances (before proration)**
Work in process	11,400.00	3,907.00
Finished good	18,600.00	7,814.00
Cost of goods sold	427,500.00	183,629.00
Total	**457,500.00**	**195,350.00**

Further, assume that the manufacturing overhead control account shows a debit balance of Birr 192,650.00, which shows an over applied balance of Birr 2,700.00. The over applied amount of manufacturing overhead will be prorated to work in process, finished good, and cost of goods sold. The proration base may be on the basis of the manufacturing overhead applied to the three accounts, or on the respective balance of the three accounts. Prorating on the basis of the manufacturing overhead applied is theoretical sound than using the year-end balance. The table below shows the proration process:

Account	Account balance	Manufacturing overhead applied (%)	Proration of the over allocated overhead	Account balance after proration
Work in process	11,400.00	3,907.00 = 2%	2% X 2,700.00 =54	11,346.00
Finished good	18,600.00	7,814.00 = 4%	4% X 2,700.00 =108	18,492.00
Cost of goods sold	427,500.00	183,629.00=94%	94% X 2,700 =2,538.00	424,962.00
Total	457,500.00	195,350.00	2,700.00	454,800.00

The following journal entry is required to show the proration of the over allocated overhead.

	Debit	Credit
Manufacturing overhead applied	195,350.00	
Work in process		54.00
Finished good		108.00
Cost of goods sold		2,538.00
Manufacturing overhead -control		192,650.00

The over allocated amount is prorated and the balance of work in process, finished good, and cost of goods sold is reduced. The amount is reduced because the costs of the three accounts initially charged higher than the actual, and thus the balance must be reduced.

The over allocated amount can be prorated on the basis of the year-end balance of the respective accounts as well. The following table shows the proration of the over allocated cost on the basis of the year-end balance of the three accounts.

Account	Account balance	Proration of the over allocated overhead	Account balance after proration
Work in process	11,400.00	11,400/457,500.00 = 2.5% 2.5% X 2,700.00 = 67.5	11,332.50
Finished good	18,600.00	18,600.00/457,500.00 = 4% 4% X 2,700.00 = 108	18,492.00
Cost of goods sold	427,500.00	427,500.00/457,500.00 = 93.5% 93.5% X 2,700.00 = 2,524.5	424,975.50
Total	457,500.00	2,700.00	454,800.00

The journal entry is the same except that the amount is different. The journal entry looks the following:

	Debit	Credit
Manufacturing overhead applied	195,350.00	
Work in process		67.50

Finished good		108.00
Cost of goods sold		2,524.50
Manufacturing overhead -control		192,650.00

Activity:
Question 3: Distinguish between actual and normal costing?
Question 4: what we mean by under and over applied over head and Describe alternative ways to dispose of under or over allocated indirect costs

3.3. Process Costing System

As discussed in the previously, a firm's cost flow parallels the flow of operations, and therefore, the production process influences the choice of cost accounting system. Firms producing distinct and unique products use job order costing whereas firms producing similar or identical units use process-costing system. Process costing system accumulate costs by department for a period of time, just as a job order costing system accumulate costs by job, and the total cost then will be assigned to the units produced during that period.

In process costing system, each unit is assumed to take equal amount of direct material, direct labor and manufacturing overhead. The difference between job order and process costing system is, thus, the extent of the averaging used to compute unit cost. In job order costing each job differs in terms of material used, labor incurred, and manufacturing overhead. Hence, it is impossible to assign the same cost for different jobs. On the contrary, identical units produced in mass took equal amount of direct material, direct labor, and manufacturing overhead. Thus, the unit cost can be found by dividing total cost by the number of units produced.

3.3.1. Cost Accumulation Methods in Process Costing System

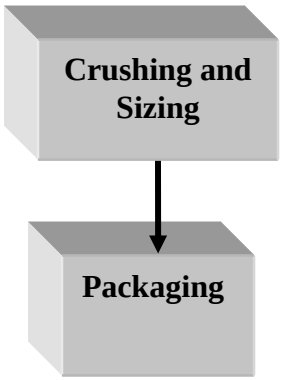
When a firm produces identical lots of goods repetitively, maintaining a separate job cost sheet would be unnecessarily expensive. The aggregate cost and the unit cost can be

computed without a job cost sheet, thus saving the costs associated with producing such records. Costs accumulate by department over a certain period and the unit cost can be found by dividing the total cost to the units produced during that period. Process costing system fit among others to, paint manufacturers, oil refineries, sugar refineries, and salt producers.

In process costing system, manufacturing costs, direct material, direct labor, and manufacturing overhead costs are accumulated in the same way as job order costing system. However, the costs are accumulated by department over some period of time than by individual jobs. The time period over which the cost is to be accumulated depends on the information needs of the company. It can be a week, two weeks, but no longer than a month most often. Cost accumulation is much simpler for a process costing system than for a job order cost system.

Illustration on process costing:

AFDER Salt Processing Share Company is engaged in processing and producing bar salt for animals. The physical flow of production is given in the diagram below:



The process costing system of AFDER Salt Processing Share Company has three cost categories; direct material cost, direct labor and manufacturing overhead cost. The direct material is added at the beginning of the Crushing and Sizing process in the Crushing and Sizing Department and Conversion costs are added through out the crushing and sizing process. Had two different types of materials been used, two different direct materials

categories would be needed to assign these costs to products. If the direct labor cost, and manufacturing overhead are used uniformly, the company can maintain only two cost accounts; direct material and conversion cost. The manufacturing overhead is applied to each department on the basis of some factor just as job order costing system. For this illustration, direct material, direct labor, and manufacturing overhead are reported separately. Only two accounts can be maintained, direct material and conversion cost, when direct labor and manufacturing overhead are added evenly through out the production process.

To utterly illustrate process-costing system, we assume three cases.

Case 1 – process costing with zero beginning and ending work in process; that is all units are started and completed in the same period.

Direct materials- material requisitions form the basis for issuing material to production in the same way as job order costing system. Normally fewer requisitions are required as compared to job order costing system as firms using process costing system manufactures only a single product in a continues operation. Materials are required when a batch of manufacturing is started. The number of requisition depends on how often a batch of product is started.

The entry to record the issuance of direct material is the same as job order costing system, but since costs are assigned to a department than a job, it is important to departmentalize the work in process account. Suppose, the materials issued to the Crushing and Sizing Department at the beginning of the month totaled Birr 240,000.00, the following entry is required to record the transaction:

Jan. 1	Work in process – Crushing and Sizing	240,000.00
	Direct material and supplies inventory	240,000.00

Direct labor – payroll costs for a specified time period is accumulated for the department. It is not necessary to punch in and out the time card whenever new batches are started since the units produced are similar, and thus, should absorb the same cost. However, if an employee works for two departments regularly, there is a need to keep record of the time spent on each department.

Suppose that the direct labor cost of AFDER Salt Processing Share Company for the month of January is Birr 72,000.00, the following journal entry is required to record the payroll:

Jan. 31	Work in process – Crushing and Sizing	72,000.00
	Wages payable	72,000.00

Manufacturing overhead – the manufacturing overhead is applied to the department using a normal predetermined overhead rate. The important thing is to identify an appropriate allocation base; direct labor cost, direct labor hours, machine hours, material cost, or conversion cost. The under or over applied overhead will be disposed at the end of the period in the same manner as it has been done with job order costing system.

Suppose the manufacturing overhead for AFDER Salt Processing Share Company is determined to be 150% of direct labor cost. Thus, the entry to record the manufacturing overhead applied to the Crushing and Sizing Department looks the following:

Jan. 31	Work in process – Crushing and Sizing	108,000.00
	Manufacturing overhead applied	108,000.00

On January 1 of the current year, there was no work in process, and the Crushing and Sizing Department transferred out 100,000 bar of animal salt to the packaging department. Data for the Crushing and Sizing Department during the month is summarized as follows:

Physical units for January	

Work in process, January 1	0 units
Work started during January	100,000 bar salt
Completed and transferred out to the Packaging department	100,000 bar salt
Work in process, January 31	0 units

Total cost for January	
Item	**Amount**
Direct material cost added during January	240,000.00
Direct labor incurred	72,000.00
Manufacturing overhead applied	108,000.00
Total cost added to the Crushing and Sizing Department	420,000.00

The unit cost of the 100,000 bar salt produced can thus be calculated as follows:

Direct material cost per unit (240,000/100,000)	2.40
Direct labor cost per unit (72,000/100,000	0.72
Manufacturing overhead applied per unit (108,000/100/000)	1.08
Total cost per unit (420,000.00/100,000)	4.20

As shown from the above table, the unit cost is calculated by dividing the total cost during a period by the total units produced in that period. Each unit is charged the same amount of material cost, direct labor, and manufacturing overhead, as they are homogenous.

The transfer of the 100,000 units to the packaging department would be recorded in the following way: The balance of work in process – Crushing and Sizing Department is Birr 420,000.00 which is the summation of direct material placed in production, direct labor costs incurred and the manufacturing overhead applied.

Jan. 31	Work in process – Packaging	420,000.00
	Work in process - Crushing and Sizing	420,000.00

Case 2 – process costing with no beginning work in process but some ending work in process inventory.

Suppose that AFDER Salt Processing Share Company started another 120,000 units of bar salt in the month of February. Since all units started in January are transferred to the packaging department, there is no beginning work in process of bar salt at the beginning of the month. From the total started during the month of February, 90,000 units are completed and 30,000 units remain just partially processed at the end of the month. The production data for the month of February is given below:

Physical units for February	
Work in process – February 1	0 units
Units started during February	120,000
Units completed and transferred out	90,000
Work in process – February 28	30,000

The 30,000 units that are left partially processed at the end of the month are complete with respect to materials because direct material is paced in the department at the beginning of the production process. The direct labor and manufacturing overhead, however, are placed to production throughout the production process. An estimate made by the production engineer, the work in process left at the end of the time is 75% complete with respect to direct labor, and 60% complete with respect to manufacturing overhead. The direct material, direct labor, and manufacturing overhead applied is summarized below:

Total cost for February	
Items	**Cost**
Direct material	288,000.00
Direct labor	81,000.00
Manufacturing overhead applied	121,500.00
Total cost of the Crushing and Sizing Department during February	490,500.00

The journal entry required to record the issuance of direct material, the payroll, and manufacturing overhead applied is the same as the previous case. How much is the cost of units completed and the work in process as of February 28 is question to be addressed by the second case. The cost of units completed and transferred out and work in process can be calculated using the following five steps:

- Step 1 – Summarize the flow of physical units of output
- Step 2 – Compute output in terms of equivalent units
- Step 4 – Compute equivalent unit cost
- Step 4 – Summarize total cost to account for
- Step 5 – Assign total costs to units completed and to units in the ending work in process

Physical units and equivalent units (step 1 and 2)

The physical unit is about the work started during the period. In the illustration, 120,000 units are started but only 90,000 units are completed. The remaining 30,000 units represent the work in process at the end of the month. The ending work in process inventory does not represent full units with respect to the three manufacturing costs like units completed and transferred out. Such partially completed units must first be changed in to equivalent units. Equivalent units of production represent the number of units that could have been manufactured from start to finish given that quantity of each input placed in production. The 30,000 units in the ending work in process inventory are 100% complete with respect to direct material, 75% complete with respect to direct labor and 60% complete with respect to manufacturing overhead. Hence, the equivalent unit with respect to direct material is 30,000 units, which is 30,000 X 100%. This means that the ending work in process inventory is fully complete with respect to direct material. With respect to direct labor, the ending work in process inventory is complete 75%, and thus, the direct labor equivalent unit is 22,500 (30,000 X 75%). The equivalent unit with respect to manufacturing overhead is 18,000 units, which is 30,000 X 60%.

		Equivalent units		
Flow of production	**Physical units**	**Direct material**	**Direct labor**	**Manufacturing overhead**
Work in process - Feb. 1	0			
Started during current period	120,000			
To account for	**120,000**			
Completed and transferred out	90,000	90,000	90,000	90,000
Work in process – Feb 28	30,000	30,000	22,500	18,000
To account for	**120,000**			
Work done in the current period		120,000	112,500	108,000

The 90,000 units are 100% complete with respect to all the three manufacturing cost, direct material, direct labor, and manufacturing overhead. The 30,000 units of work in process as of Feb. 28 are 100% complete with respect to direct material, 75% complete with respect to direct labor, and 60% complete with respect to manufacturing overhead.

Activity:
Question 5:

i. for the current period, Mart started 15,000 units and completed 10,000 units, leaving 5,000 units in process 30 percent complete. How many equivalent units of production did mart have for the period?

ii. Explain equivalent units? Why are equivalent unit calculations necessary for process costing?

Calculation of product costs (step 3, 4, 5)

The direct labor material cost of Birr 288,000 is to produce 120,000 units, whereas the direct labor cost of Birr 86,400.00 is to produce 112,500 units, and the manufacturing overhead applied of Birr 129,600.00 is to produce 108,000 units. The table below shows the equivalent unit cost, the total cost to account for, and the cost of the finished good and work in process inventory. It is called production cost work sheet.

Item	Total production cost	Direct material	Direct labor	Manufacturing overhead
Costs added	490,500.00	288,000.00	81,000.00	121,500.00

during Feb.				
Equivalent unit		120,000	112,500	108,000
Per unit cost		288,000/120,000 **2.40**	81,000/112500 **0.72**	121,500/108,000 **1.125**
Completed and transferred out (90,000 units)	**382,050.00**	2.4 X 90,000 **216,000.00**	0.72 X 90,000 **64,800.00**	1.125 X 90,000 **101,250**
Work in process - Feb. 28 (30,000 units)	**108,450.00**	2.4 X 30,000 **72,000.00**	0.72 X 22,500 **16,200.00**	1.125 X 18,000 **20,250.000**
Total cost to account for	**490,500.00**			

The cost of goods transferred out to the packaging department equals 382,050.00, and thus the unit cost is Birr 4.245, where as the work in process inventory at the end of the period amounts to Birr 108,450.00. The following journal entry is required to record the transfer of the units completed and transferred out to the next department:

Work in process – Packaging	382,050.00
Work in process – Crushing and Sizing	382,050.00

Case 3 – process costing with both some beginning and ending work in process

The work in process at the end of February becomes the beginning inventory of March. Suppose that AFDER Salt Processing Share Company started another 150,000 units during the month of March, and 140,000 units are completed and transferred out, 40,000 units remain unfinished. The following table contains data for the Crushing and Sizing

Department in March:

Physical units in March	
Work in process – March 1 Direct material 100% complete Direct labor 75% complete Manufacturing overhead 60% complete	30,000
Units started during March	150,000
Units to account for	**180,000**
Completed and transferred out	140,000
Work in process – March 31 Direct material 100% complete Direct labor 60% complete Manufacturing overhead 48% complete	40,000

Total cost incurred during the month of March is shown in the table below:

Work in process – March 1	
Direct materials (30,000 X 2.40)	72,000.00
Direct labor (22,500 X 0.768)	16,200.00
Manufacturing overhead (18,000 X 1.20)	20,250.00
	108,450.00
Manufacturing costs added during March:	
Direct material cost	375,000.00
Direct labor cost incurred	118,080.00
Manufacturing overhead applied	177,120.00
Total costs incurred during March	**670,200.00**
Total cost to account for	**778,650.00**

The peculiar thing for this case is how to assign costs to the work in process as of March 31. In this regard, there are two alternatives in how to assign costs to units completed and transferred out, and work in process: one is to use a weighted average unit cost of production (cost of the beginning work in process plus cost of production incurred during the period), and the other is to use the FIFO method to determine unit costs. FIFO assumes costs flow in the order the cost is incurred. The first units to be completed are

from the beginning work in process, and the cost incurred during the current period is used first to complete the beginning work in process, then to complete units started in the current period and finally to ending work in process.

THE WEIGHTED AVERAGE METHOD

The weighted average method accumulates costs incurred to date (both the work in process cost at the beginning of the period as well as production costs incurred during the current month). The total cost accumulated then is assigned to the equivalent units completed and transferred out and units in the ending work in process inventory. The weighted average cost is the total cost entered the work in process account to date divided by the total equivalent units of work done to date. Analogous to the previous case, the following five steps should be followed to determine the unit cost of production:

Step 1: Summarize the physical flow of outputs - the summary of the physical flow of outputs shows from where the units came and where they go. The underneath table shows the physical flow of goods for AFDER Salt Processing Share Company for the month of March:

Flow of production	**Physical units**	**Equivalent units**		
		Direct material	Direct labor	Manufacturing overhead applied
Work in process – March 1.	30,000			
Units started during March	150,000			
Total units to account for	**180,000**			
Completed and transferred out	140,000	140,000	140,000	140,000
Work in process – March 31 Direct material 100% Direct labor 60% complete Manufacturing overhead 48%	40,000	40,000	24,000	19,200
To account for	**180,000**			
Work done to date		180,000	164,000	159,200

Step 2 – Compute out put in terms of equivalent units

All units that entered the manufacturing process are complete with respect to direct material as direct materials are placed at the beginning of the production process in the department. However, it is only the completed and transferred amount that is 100% complete with respect to direct labor and manufacturing overhead. The ending work in process is only partially complete with respect to direct labor and manufacturing overhead. Suppose the ending work in process is 60% complete with respect to direct labor, and 48% complete with respect to manufacturing overhead. Hence, the equivalent unit of production with respect to direct labor is 24,000 units (40,000 X 60%), and the equivalent unit of production with respect to manufacturing overhead is 19,200 units (40,000 X 48%).

Step 3 – Compute equivalent unit cost

The weighted average equivalent unit cost is obtained by dividing the sum of costs in the beginning work in process inventory and cost of work done in the current period by total equivalent units of work done to date. The equivalent unit cost for direct material is equal to the direct material cost of the work in process at the beginning of the month plus direct material cost placed in production during March divided by total equivalent units to date with respect to direct material. Similarly, the equivalent unit cost for direct labor and manufacturing overhead is calculated by adding total cost of direct labor and manufacturing overhead to date and then diving the sum by equivalent units of production with respect to direct labor and manufacturing overhead. The table in the following page shows the equivalent unit production with respect to direct material, direct labor, and manufacturing overhead.

Step 4 – Summarize total cost to account for

The total cost to account for is the sum of the three manufacturing costs of the beginning work in process and manufacturing costs added to production in the month of March.

Step 5 – Assign costs to units completed and units in ending work in process inventory

The total cost of units completed and transferred out is computed by multiplying the equivalent unit cost by total units completed. Like wise, the cost of ending work in

process is computed by multiplying the equivalent units with respect to direct material, direct labor, and manufacturing overhead by the respective equivalent unit cost.

The table below summarizes the last three steps:

	Total production cost	Direct material	Direct labor	Manufacturing overhead
Work in process – March 1	108,450.00	72,000.00	16,200.00	20,250.00
Costs added during March	637,700.00	375,000.00	105,080.00	157,620.00
Costs incurred to date	746,150.00	447,000.00	121,280.00	177,870.00
Equivalent units		180,000	164,000	159,200
Cost per equivalent unit		**2.483**	**0.739**	**1.117**
Total cost to account for	746,150.00			
Assignment of costs:				
Units completed and transferred out	140,000			
Cost of units completed and transferred out	607,617.00	347,667.00	103,532.00	156,458.00
Work in process March 31	138,533.00	99,333.00	17,748.00	21,452.00

As the table shows cost of goods manufactured is Birr 607,617.00, and the value of cost of work in process as of March 31 is Birr 138,553.00. The journal entry to record the transfer of the units completed and transferred out is as follows:

Work in process – Packaging	607,617.00
Work in process – Crushing and Sizing	607,617.00

THE FIRST IN, FIRST OUT METHOD

ACTIVITY:

Question 6: ABC Inc. furnisher the following data for August 2004, the department-assembly:

Work in process, beginning inventory (August 1)	=	0 units
Started during August	=	5000 units
Completed and transferred	=	3750 units
Work in process, ending inventory (August 31)	=	1250 units
Direct material costs added during August	=	Br 125,000
Conversion costs added during August	=	71,250
Total cost		Br 196,250

Degree of completion in this department:
Direct materials 100%; conversions cost 80%.

Required :
Compute the equivalent units of production and cost per equivalent by using weighted average method?

The first in, first out method assume that the first units to be completed are from the beginning work in process, and thus assign the cost of the beginning work in process to the first units completed. The cost of equivalent units worked during the current period is assigned first to complete the beginning work in process, and then to start and complete new units, and finally to units in ending work in process.

Under the first in, first out method, the cost of the work in process at the beginning of the period is kept separate from the work done in the current period. Costs incurred in the current period and equivalent units produced in the same period are used to calculate unit cost per equivalent unit of work done in the current period. To illustrate the first in, first out method of process costing, we assume the previous data for the month of March, and the five steps are restated:

Step 1 – Summarize the flow of physical units

The first units to be completed are the 30,000 units of work in process at the beginning of the period i.e., March 1. From the 150,000 units started during March, 110,000 units are completed during the month, 40,000 units are left as work in process at the end of the Month, March 31.

Step 2 – Compute out put in terms of equivalent units

The equivalent unit calculation under the first in first out method is different from that of the weighted average method. The equivalent unit of the beginning work in process will

be kept separate from the equivalent units of the current month work done. The equivalent unit of the current month work done includes the equivalent units used to complete the beginning work in process, the equivalent units of the goods started and completed during the current month, and the equivalent units of work in process at the end of the month.

The following table shows the equivalent unit calculation for the current month work done:

Flow of production	**Physical units**	**Equivalent units**		
		Direct material	Direct labor	Manufacturing overhead applied
Work in process – March 1.	30,000 (work done before the current month)			
Units started during March	150,000			
Total units to account for	**180,000**			
Completed and transferred out from beginning work in process	30,000	0[1]	7,500[2]	12,000[3]
Started and completed during the current month	110,0000	110,000	110,000	110,000
Work in process ending	40,000	40,000	24,000	19,200
To account for	**180,000**			
Work done to date		150,000	141,500	141,200

The ending work in process is 100% complete with respect to direct material as direct material is placed at the beginning of operation, and 60% complete with respect to direct labor, and 48% complete with respect to manufacturing overhead. Thus, the equivalent unit from the ending work in process is 40,000, 24,000, and 19,200 with respect to direct material, direct labor, and manufacturing overhead respectively.

[1] Since the work in process is 100% complete with respect to direct material, no direct material is added to the beginning work in process.
[2] Since the beginning work in process is 75% complete with respect to direct labor, the amount left is just only 25%. Thus, the equivalent unit added during the current month is 7,500.00 with respect to direct material i.e., 30,000 X 25%
[3] The work in process is 60% complete with respect to manufacturing overhead, and thus, the amount required to complete is 40%. Thus the current month equivalent unit to complete the beginning work in process with respect to manufacturing overhead is 12,000.00 i.e., 30000 X 40%

Step 3 – Compute Equivalent Unit Costs

The total manufacturing costs incurred during the current month, and the equivalent units of production during the same period are used to calculate the equivalent unit costs.

Step 4 – Summarize total cost to account for

The total cost to account for is the summation of cost of work in process at the beginning of the period, and the total manufacturing cost incurred during the current period.

Step 5 – Assign costs to units completed and to units in ending work in process

The equivalent unit costs for the work done in the current period are first used to complete the beginning work in process, then to units started and completed during the current period, and then to the ending work in process. The table on the next page exhibits cost assignment.

	Total production cost	Direct material	Direct labor	Manufacturing overhead
Work in process – March 1	108,450.00 (costs before the current month)			
Costs added during March	637,700.00	375,000.00	105,080.00	157,620.00
Equivalent units of work done in the current period		150,000	141,500	141,200
Cost per equivalent per unit for the work done in the current period		2.50	0.743	1.116
Total cost to account for	**746,150.00**			
Assignment of costs Completed and transferred during the current month (140,000 units) From beginning WIP 30,000 units	108,450.00			
Direct material	0	(no material is added in the current month)		
Direct labor	5,570.00	0.742 X 7,500 units		
Manufacturing overhead	13,395.00	1.116 X 12,000 units		

Total from beginning inventory	**127,415.00**
Started and completed	
Units started and completed during the current month:	
Direct material	275.000.00 (2.50 X 110,000)
Direct labor	81,688.00 (0.743 X 110,000)
Manufacturing overhead	122,792.00 (1.116 X 110,000)
Started and completed units	**479,480.00**
Total cost of units completed	**606,895.00**
Work in process March 31:	
Direct material	100,000.00
Direct labor	17,823.00
Manufacturing overhead	21,432.00 **139,255.00**
Total cost to account for	**746,150.00**

The following journal entries are required to record the issuance of direct material, direct labor, manufacturing overhead, and the transfer of units completed.

Work in process – Crushing and Sizing Inventory of Direct materials To record issuance of direct material to production	375,000.00 375,000.00
Work in process – Crushing and Sizing Wage payable To record payroll for the month	105,080.00 105,080.00
Work in process – Crushing and Sizing Manufacturing overhead applied To record the manufacturing overhead applied	157,620.00 157,620.00

The work in process – Crushing and Sizing account has a beginning balance of 108,450.00, which is the value of the beginning work in process. The work in process added during the current month is the summation of direct material, direct labor and manufacturing overhead applied, which is 637,700.00. The total balance of the work in process before recording the transfer of units completed is thus, 746,150.00. The following journal entry is required to record the transfer of units completed:

Work in process – Packaging	606,895.00
Work in process – Crushing and Sizing	606,895.00

The work in process – Crushing and Sizing has now a balance of 139,255.00, which represent the value of the ending work in process.

3.3.2. Standard costing method of process costing

The weighted average and the FIFO method become very complicated when a company produces a wide variety of similar products. For instance, a Steel-processing factory can produce different sizes of various steel alloys that differ in terms of the total direct material used, direct labor and manufacturing overhead. If broad averaging of actual costing is used, the different products will be charged inaccurate amount of costs. Under the standard costing method, a team from different department set standard cost per equivalent unit on the basis of the different technical processing specifications for each product. Each product will then be charged using the standard cost per equivalent unit. Use of standard costing overcomes the disadvantages of a single average actual process costing.

Suppose a team organized to set standard cost per equivalent unit in the previous example of AFDER Salt Processing Share Company has reached on the following standard costs:

Direct material	2.40 per unit
Direct labor	0.72 per unit
Manufacturing overhead	1.08 per unit
Total	4.20

The five steps will also be used here in standard costing. The first and second step has been done in the following table. The remaining steps are given beneath the table below:

	Physical units	**Equivalent units**		
		Direct material	Direct labor	Man. Overhead
Work in process – March 1 Direct material (100% complete) Direct labor (75% complete) Manufacturing overhead (60% complete)	30,000	Work done before the current month		
Started during March	150,000			
Total units to account for	**180,000**			
Completed and transferred out from beginning work in process	30,000.00	0	7,500	12,000
Started and completed during March	110,000	110,000	110,000	110,000
Work in process – March 31 Direct material (100% complete) Direct labor (60% complete) Manufacturing overhead (48% complete)	40,000	40,000	24,000	19,200
Total units tom account for	**180,000**			
Work done in the current period only		150,000	141,500	141200

The total cost to account for is the amount that is found using the standard cost amount, which may be different from the actual cost. Any variance from the actual cost is closed to the direct material variance, direct labor variance, or manufacturing overhead variance.

	Total production cost	Direct material	Direct labor	Manufacturing overhead
Standard cost per equivalent unit		2.40	0.72	1.08
Work in process – March 1	107,640.00	72,000.00	16,200.00	19,440.00
Costs added during March at standard cost	614,376.00	360,000.00	101,880.00	152,496.00
Total cost to account for	**722,016.00**			
Assignment of costs: Completed and transferred during the current month (140,000 units)				
WIP – March 1 (30,000 units)	107,640.00			
Direct material added current period	0 (no material is added in the current month)			
Direct labor	5,400.00 0.72 X 7,500 units			
Manufacturing overhead	12,960.00 1.08 X 12,000 units			
Total from beginning inventory	126,000.00			
Started and completed (110,000 units)	462,000.00	264,000.00	79,200.00	118,800.00
Total cost of units completed	**588,000.00**			
Work in process March 31: (40,000 units) Direct material Direct labor Manufacturing overhead	 96,000.00 17,280.00 20,736.00 **134,016.00**			
Total cost to account for	**722,016.00**			

The actual cost incurred is recorded in the following manner:

Direct labor control - Crushing and Sizing Department	105,080.00
Wage payable	105,080.00
To record payroll for the month	

Manufacturing Overhead control – Crushing and Sizing Department ----------	157,620.00
Various accounts ----------	157,620.00
To record the manufacturing overhead applied	

If the manufacturing overhead applied is based on standard costing, it will be recorded in the following manner:

Work in process – Crushing and Sizing Department	157,620.00
Manufacturing overhead applied	157,620.00
To record the manufacturing overhead applied	

The variance between standard costing and actual costing is recorded in the following way:

Work in process – Crushing and Sizing Department	360,000.00
Direct material variance	15,000.000
Direct materials control – Crushing and Sizing Department	375,000.000
To record actual direct material used and direct material variance	

Work in process – Crushing and Sizing Department	101,880.00
Direct labor variance	3,200.00
Direct labor control – Crushing and Sizing Department	105,080.00
To record actual direct labor incurred and direct labor variance	

The manufacturing overhead variance is recoded only if the actual manufacturing overhead is used. If the manufacturing overhead is applied, the applied by itself is part of

the standard cost, and thus, no variance. Suppose that the manufacturing overhead charged to job is based on actual cost, the journal entry to record the variance is then as follows:

Work in process – Crushing and Sizing Department	152,496.00
Manufacturing overhead variance	5,124.00
Manufacturing overhead control – Crushing and Sizing Department----------	157,620.00
To record actual manufacturing overhead and manufacturing overhead variance	

3.3.3. Transferred in costs

As units move from one department to the other, the related costs are also transferred by using journal entries. A cost transferred from a preceding department is called Transferred in cost, or cost of the preceding department or previous department cost. The costs of the next department then contain four elements: transferred in costs, direct material cost, direct labor cost, and manufacturing overhead costs. Transferred in costs are considered as a separate type of direct material added at the beginning of the process. In other words, when successive departments are involved, the cost of the preceding department become part of the direct material cost of the next department. However, transferred in costs are not considered as cost of direct material. Assume that the Packaging Department of AFDER Salt Processing Share Company have a beginning work in process inventory of 24,000 units, and the units transferred from the Crushing and Sizing Department in the month of March is 140,000 units. Further, direct labor and manufactured overhead are applied evenly through out the Packaging department. Thus, direct labor and manufacturing overhead are combined as conversion cost.

3.3.3.1. Transferred in Costs and the Weighted Average Method

The five steps of process costing are restated here to account for and assign costs in the Packaging Department.

Flow of production		**Transferred in costs**	**Direct material cost**	**Conversion costs**
WIP – Beginning	24,000			
Transferred in during the current month	140,000			
To account for	**164,000**			
Completed and transferred out	120,000	120,000	120,000	120,000
WIP – ending	44,0000	44,000	0	35,200
Accounted for	**164,000**			
Work done		164,000	120,000	155,200

Step 1 and 2 physical units and equivalent units

The Packaging Department has a beginning inventory of 24,000 units that are 100% complete with respect to transferred in costs as the beginning work in process are completed units of the preceding department. Packaging materials are added at the end of the production process in the Packaging Department, and therefore, the beginning work in process is 0% complete with respect to direct material. Assume that the beginning work in process is 50% complete with respect to conversion costs. Suppose that 120,000 units are completed and become finished goods, and 44,000 units remained as ending work in process at the end of March. The ending work in process in the department is 100% complete with respect to transferred in costs, and 0% complete with respect to direct material (materials are added in the department at the end of the production process). Suppose that the ending work in process is 80% complete with respect to conversion cost. The table on the next page shows how the physical units and equivalent units are determined.

Assume that the following costs are incurred in the Packaging Department in the month of March.

Transferred in costs[4]	607,617.00
Direct material	60,000.00
Conversion costs	116,400.00

The cost of the work in process account at the beginning of the period is given below:

Transferred in costs[5]	105,600.00
Direct material	0
Conversion costs	9,000.00
Total	114,600.00

The direct material cost is 0 for the beginning work in process of the Packaging Department since materials are placed at the end of the production process in the Packaging Department.

The equivalent unit cost and the assignment of costs to units completed and work in process is summarized in the table below:

	Total production cost	Transferred in costs	Direct material	Conversion costs
WIP – beginning	114,600.00	105,600.00	0	9,000.00
Costs added in current period	784,017.00	607,617.00[6]	60,000.00	116,400.00
Costs incurred to date		713,217.00	60,000.00	125,400.00
Equivalent units		164,000	120,000	155,200
Equivalent unit cost to date		4.35	0.50	0.81

[4] The costs of units completed in the Crushing and Sizing Department using the Weighted Average method.
[5] The costs of the work in process in the Packaging department at the beginning of March, which is transferred from the preceding department (Crushing and Sizing). It includes cost of direct material, direct labor, and manufacturing overhead.
[6] The cost of the 140,000 units transferred from the Crushing and Sizing Department in the current month to the Packaging Department.

Total cost to account for	**898,617.00**			
Cost of units completed (120,000) units	678,825.00	4.35X120,000 521,866.00	0.5X120,000 60,000.00	0.81X120,00 96,959.00
WIP – ending	219,792.00	191,351.00	0	28,441.00
Total cost to account for	**898,617.00**			

There is some rounding error.

Units completed in the Packaging department are finished goods and the following journal entry is required to show the transfer of the goods from the Packaging department to the finished good warehouse:

Finished good	678,825.00
Work in process – Packaging	678,825.00

3.3.3.2. Transferred in Costs and the First In, First Out Method

The equivalent unit cost determination is the same as it has been done for the Crushing and Sizing Department except for the addition of transferred in costs. The five steps are restated:

Step 1 and 2 – physical units and equivalent units

Flow of production		**Transferred in costs**	**Direct material cost**	**Conversion costs**
WIP – Beginning	24,000			
Transferred in during the current month	140,000			
To account for	**164,000**			
Completed and	120,000			

transferred out: From the WIP – beg. Started and completed		 0 96,000	 24,000 96,000	 12,000 96,000
WIP – ending	44,0000	44,000	0	35,200
Accounted for	**164,000**			
Work done		140,000	120,000	143,200.00

The following costs are incurred in the current period:

Transferred in costs[7]	105,600.00
Direct material	0
Conversion costs	9,000.00
Total	114,600.00

Step 3 through 5 is given away in the underneath table:

	Total production cost	**Transferred in costs**	**Direct material**	**Conversion costs**
WIP – beginning	114,600.00	Costs before the current period work done		
Costs added in current period	783,295.00	606,895.00[8]	60,000.00	116,400.00
Equivalent units		140,000	120,000	143,200
Equivalent unit cost in the current period		4.33	0.50	0.81
Total cost to account for	**897,895.00**			
Completed and				

[7] The costs of the work in process in the Packaging department at the beginning of March, which is transferred from the preceding department (Crushing and Sizing). It included cost of direct material, direct labor, and manufacturing overhead.

[8] The cost of the 140,000 units transferred from the Crushing and Sizing Department in the current month to the Packaging Department.

transferred out WIP- beg. (24,000) units	114,600.00			
Costs added	21,754.00	0	12,000	9,754.00
Started and completed	542,191.00	416,157.00	48,000.00	78,034.00
Total cost of units completed and tra.	**678,545.00**			
WIP –ending	**219350.00**	190,738.00	0	28,612.00
Total cost to account for	**897,895.00**			

The following journal entry is required to show the transfer of the 120,000 unit from the production Department to the finished good warehouse.

Finished good	897895.00
Work in process – Packaging	897,895.00

Activity:

Question 7. Assume the following data belongs to Dept. 'A' of **XYZ Company** for the month of February.

	Quantities (Physical Units)		
WIP, Beginning ……	24,000		
DM (100% Complete)			
CC(40% Complete)			
Started During February ……..	50,000		
Completed & transferred out during February……	60,000		
WIP, Ending ……	14,000		
DM (100% complete)			
CC (50% Complete)			
Total costs for the month:			
WIP, beginning Inventory			
DM…….Br. 14,400			
CC……..	13,440	Br. 27,840	
Direct material costs added during the month …….		22,600	
Conversion costs added during the month ……..		80,360	
Total costs to account for ……		Br. 130,800	

Instruction:

Calculate: a) the cost of completed & transferred out units and the costs of End WIP,
By Using FIFO costing method

3.4. Chapter Summary

Several terms and concepts are used in cost allocation which include cost pool which refers to the grouping of individual cost items. Two key decisions in relation to indirect cost pools are the number of indirect cost pools that form them and the allowability of individual cost items to be included in those cost pools. Cost object is the destination of all costs allocated and the cost driver is the cause to incur cots. To allocate the costs to products or services, several methods are used. A traditional approach is a method of allocating by pooling all indirect costs in to one cost pool and using a single allocation rate. It uses a single allocation base to allocate the overhead costs.

Job order costing is used by organizations whose production and services can be identified by individual jobs, or units. Each job generally receives changing amount of direct labor, direct material, and factory overhead. An organization using job order costing system would accumulate production costs for each job produced. Since units in different jobs use different amounts of direct labor, direct material, and factory overhead, the cost per unit of for different jobs will differ. Industries that use job costing system include Printing, construction, custom machinery production, furniture production…etc.

Process costing systems are used in industries like chemical processing, oil refining, etc. The key feature of process costing is the averaging of cots over a quantity of these like or similar units. The five key steps in a process costing system using equivalent units are (a) Summarize the flow of physical units of output, (b) Compute output in terms of equivalent units, (c) Compute equivalent unit costs,(d) Summarize total cost to account for and (e) assign these costs to units completed and to units in ending work in process.

An equivalent unit measures output in terms of the physical quantities of inputs necessary to produce one fully complete unit of the product or service. Equivalent unit calculations are necessary when all physical units of output are not uniformly completed.
Journal entries in a process costing system are similar to entries in a job costing system. The main difference is that in a process costing system, there is a separate work in process account for each department rather than for each job.

The weighted average method of process costing computes unit costs focusing on the total costs and the total equivalent units completed to date and assigns this average cost to units completed and to units in ending work in process inventory. The first in first out (FIFO) method of process costing assigns unit costs of the earliest equivalent units available to units completed, and the units costs of the most recent equivalent units worked on during the period to ending work in process inventory.

3.5. Self-Test Questions

Now, before proceeding to the next chapter, answer the following questions:
Part I: choose the best answer.

1. When the actual over head cost is greater than the applied over head cost we say that over head is:
   a) Under applied
   b) Over applied
   c) Over allocated
   d) None
2. For the completion of work-In-Process inventory of end of accounting period, additional costs required are:
   a) Direct materials

b) Direct labor
c) Factory over head
d) B and C
e) A and C

3. All are features of Job order costing system, except
   a) Outputs are manufactured in jobs.
   b) Products are not identical to satisfy identification.
   c) The system accumulates costs applicable to each specific job.
   d) Outputs are produced on continuous flows of goods
   e) C and D
4. When the over applied factory over head is disposed through proration based on ending balances of inventories and cost of goods sold,
   a) After proration, the inventories balance increase than before
   b) Cost of goods sold decrease after proration
   c) The inventories balance decrease after proration
   d) Gross profit increase after proration
   e) All except 'A' are correct
5. When factory overhead under applied is disposed **through write-off to cost of goods sold**,
   a) Cost of goods sold after disposition increases
   b) Gross profit increases for the amount charged to CGS
   c) Gross profit decreases for the amount charges to CGS.
   d) A and C
   e) B and C
6. If a company has a policy of applying over head costs to products on the basis of direct labor hours and if direct labor hours actually worked is 25,000 hours and budgeted factory over head is 2 times actual direct labor hours used ,what is the overhead cost applied to a product?
   a) 25,000
   b) 30,000
   c) 50,000
   d) 100,000

7. If the total manufacturing cost of enterprise is $ 210,000 and direct material, and direct labor costs are $ 50,000 and $ 50,000, respectively and if at the end of an accounting period factory overhead incurred was determined to be $ 108,000.

   Based on this information we say that factory overhead is
   a) Over applied by $ 92,000
   b) Under applied by $ 18,000
   c) Over applied by $ 2,000

d) Under applied by $ 2000

8. WBO Company is army-gun producing company. It receives different job orders through out the year, 2004. At the end of 2004 year, Job order SPL-A30 is incomplete. The direct material cost of this job is $ 20,000 and direct labor used is $ 30,000. The company applies factory overhead based on direct labor cost and budgeted rate through out the year is 75%. Considering this information, what is the cost of Job-SPL-A30?
   a) 22,500
   b) 72,500
   c) 60,000
   d) 75,000
9. One of the following is not a characteristic of process costing system
   a) Units in one Department are transferred-out only upon completion.
   b) Costs are accumulated for each Department, or Cost center.
   c) Products are manufactured under mass production of homogeneous type of products.
   d) Unit cost will decrease as the units flow from Department to Department.
   e) All of the above
   f) None of the above
10. Which of the following is a feature of process costing system?
   a) Outputs are manufactured in jobs.
   b) Products are not identical to satisfy identification.
   c) The system accumulates costs applicable to each specific job.
   d) Outputs are produced on continuous flows of goods
   e) B and D only
   f) All of the above
11. For which of the following business organization would the process costing systems be the most appropriate?
   a) Custom furniture manufacturer
   b) Commercial building contractor
   c) Crude oil refinery
   d) All
   e) None of the above

12. The group of manufacturing costs referred to as "**conversion costs**" include:
   a) Direct materials costs and direct labor costs
   b) Direct materials and factory overhead costs
   c) Direct labor costs and factory overhead costs
   d) None of the above

13. Information relating to production in **Department "A"** for May is as follows:
    May 1, balance, 1,000 units ¾ completed ……..$ 22,150
    May 31, Direct materials, 5,000 units ……75,000
    May 31, Direct labor costs……...32,500
    May 31, factory overhead costs……..16,250
    If 500 units were ¼ completed at the end of May,
    5,500 units were completed during May, and inventories are costed by FIFO method, what were the equivalent units of production for May?

    A. 6,500 B 5,875 C. 7,500 D. None of the above

14. Based on the data presented in the question NO.13 above, what is the unit conversion cost?
    A. 20 B .35 C. 23 D. None of the above

Part II: Work out Questions

1. Summarized cost data for the year ended **Sene** 30, 2002 are presented below for **KURAZ Printing Press enterprise** to illustrate job order costing system.

Assume that the enterprise has **two jobs in process** during the year, job No. 1 and No. 2. Job No 1 was started in the previous year, and had beginning balance of $40,000 on the Hamle 1, 1986. Job No. 2 was started in the current accounting period (Hamle 1, 2002).

The following transactions were occurred in the current accounting period (2002**)**:-

1. Materials were purchased during the fiscal year at a total cost of $ 70,000 on account. On Hamle 1, 2001, the material inventory account shows a balance of $ 15,000 Debit.
2. During the year, the cost of material requisitioned for production on both jobs amounts Br. 60, 000, of this amount, the direct materials cost traceable to job No. 1 & job No.2 are Br 32,000 & Br. 25,000, respectively. The reminder is cost of indirect material used up during the year on both jobs.
3. Total wages, and salaries of manufacturing employees accrued amounted to Br. 85,000 for the year. The Wages & salaries traceable to job No. 1 and No. 2 are Br. 45,000 and Br. 25,000 respectively. The remainder is considered as indirect labor costs.
4. The enterprise incurred the following general factory costs applicable to both jobs during the year:
    - Utilities (Heat, light & powers)…….Br.25,000
    - Rent on factory equipment …….. 20,000

- Miscellaneous factory expense …… 2, 000

Total Costs 47,000

5. During the year, the enterprise recognized Br. 12,000 in accrued property taxes on factory & equipment, and $10,000 in insurance expired on factory building, and non-rented equipment.
6. The enterprise recognized a depreciation of Br.16,000 on factory non-rented equipment and machinery
7. The company selected the machine hours as an application for FOH costs.
   The yearly budgeted FOH cost amounts in total Br. 630,000
   The yearly budgeted machine hours requirement for all jobs is 105,000 hours
   During the year, 10,000 machine hours were worked on Job No. 1, and 5000 machine hours were worked on Job No. 2.
8. During the year Job No. 1 have 200 units completed and transferred to warehouse & job No. 2 was still in process on Sene 30, 2002.
9. By the end of the year ¾ of units in job NO. 1 were shipped to customers at the total sales value of Br. 200,000. The enterprise had no beginning balance of finished goods for this year.
10. The following non-manufacturing costs were incurred during the year ended:
    Sene 30, 2002- Office salary- Br. 30,000
    - Depn on office equipment..7,000
    - Advertising expense------ 42,000
    - Other selling & administrative Exp. 8,000

Required:- Record all the above transactions in a general journal form.

2.At the beginning of September 2003, **XYZ Inc.** had 1250 units partially assembled units in the Assembly Department. During September 2003, XYZ Inc. placed another 4000 units into production. Data for the Assembly Department for Sept, 2003 are:

Physical units for September, 2003

Work in process, beginning inventory (Sep 1) 1250 units

Direct Materials (100% complete)

Conversion costs (80% Complete)

Started during September	4000 units
Completed and transferred out during September	4250 units
Work in process, ending inventory (Sep 30)	1000units
Direct Materials (100% complete)	
Conversion cost (60% complete)	

Total Costs for Sep 2003

Work in Process, beginning inventory

Direct Materials (1250 equivalent unit x Br25 per unit	31250
Conversion cost (1000, equivalent units x Br15 per unit)	15000
	46250
Direct materials costs added during September	100000
Conversion costs added during September.	72300
Total costs to account for	218550

Required: Using FIFO METHOD

1 Compute equivalent units for direct materials and conversion costs.

2 Also calculate the cost per equivalent unit for direct materials and conversion costs, Summarized total cost to account for.

CHAPTER FOUR: SPOILAGE, REWORKED UNITS AND SCRAP

Learning objectives:

Dear students, after completing this chapter you should be able to:

- ☞ Distinguish among spoilage, rework, and scrap
- ☞ Describe the general accounting procedures for normal and abnormal spoilage
- ☞ Account for scrap

Dear students! In this section the concepts and the accounting process of spoilage, rework and scrap. Reducing spoilage, reworked units, and scrap are important aspects of managing costs and improving quality. To achieve these goals, companies use sophisticated equipment and systems to monitor and control their processes.

Managers are focusing increasing increasingly on improving quality and reducing defects they have learned that a rate of defects regarded as normal in the past in no longer tolerable. Many managers believe that reducing defects reduces costs and makes their company more competitive. Recording and highlighting the costs of defects in a timely way helps managers make more informed decisions about managing these costs.

This section concentrates on three types of costs that arise as a result of defects – spoilage, rework, and scrap – and ways to account for them. The focus is on determining the cost of products and on valuing inventory and cost of goods sold.

Dear student! We start by defining key terms used in this section. **Spoilage** is unacceptable units of production that are discarded or are sold for reduced prices. Partially completed or fully completed units of output can be spoiled. Examples are defective shirts, jeans, shoes, and carpeting sold as “seconds” and defective aluminum cans sold to aluminum manufacturers for re-melting and production of aluminum cans. **Rework** is unacceptable units of production that are subsequently repaired and sold as, acceptable finished goods. For example, defective units of products (such as pagers, computer disk drives, computers, and telephones) detected during production or

immediately after production but before units are shipped to customers can sometimes be reworked and sold as good products. Scrap is material left over when making a product(s). it has low sales value compared with the sales value of the product(s). Examples are shavings and short lengths from woodworking operations, edges left over from plastic molding operations. And frayed cloth and end cuts from suit –making operations.

Some amount of spoilage, rework, or scrap appears to be an inherent part of many production processes. One example is semiconductor manufacturing, where the products produced are so complex is semiconductor manufacturing, where the products produced are so complex and delicate that some spoiled units are in variably produced. In this case, the spoiled units cannot be reworked. An example involving spoilage and rework occurs in the manufacture of high –precision machine tools that must be built to very exacting tolerances. In this case, spoiled units can be reworked to meet standards but only at a considerable cost. And in the mining industry, companies process ore that contains varying amounts of valuable metals and rock. Some amount of rock, which is scrap, in inevitable, but its volume can often be decreased. Managers in all industries must strive to reduce costly spoilage, rework and scrap. We focus first on spoilage.

4.1. Types of Spoilage

The key objectives in accounting for spoilage are determining the magnitude of the costs of spoilage and distinguishing between the costs of normal and abnormal spoilage. To manage spoilage costs, companies need to highlight these costs and not bury them as an unidentified part of the costs of good units manufactured managers can hen use this information to cost products and to control and reduce costs by improving the quality of the products and processes.

4.1.1. Normal Spoilage

Normal spoilage is spoilage that is an inherent result of the particular production process and arises even under efficient operating conditions. For a given production process, management must decide the rate of spoilage it is willing to accept as normal. Costs of normal spoilage are typically treated as a component of the costs of good units

manufactured because good units cannot be made without the simultaneous appearance of spoiled units. Normal spoilage rates should be computed using total good units completed as the base, not total actual units stated in production. Why? Because total actual units started also include any abnormal spoilage in addition to normal spoilage. More-over, normal spoilage is the amount of expected spoilage associated with or related to the good units produced.

4.1.2. Abnormal Spoilage

Abnormal spoilage is spoilage that should not arise under efficient operating conditions. It is not an inherent result of the particular production process. Abnormal spoilage is usually regarded as avoidable and controllable. Line operators and other plant personnel can generally decrease abnormal spoilage by minimizing machine breakdowns, accidents, and the like. Abnormal spoilage costs are written off as losses of the accounting period in which detection of the spoiled units occurs. To gain the most information from abnormal spoilage costs, companies record the units of abnormal spoilage and keep a separate loss from Abnormal spoilage account, which appears as a separate line item in the period`s income statement.

Many companies, such as the Toyota motor corporation, adhere to a perfection standard as a part of their emphasis on total quality control. Their ideal goal is zero defects. Hence, all spoilage would be treated as abnormal.

Issues about accounting for spoilage arise in both process – costing and job –costing systems.

Timeout! Have you understood the concept of Spoilage, rework and scrap? Good! Now let's do the following exercise:

Activity:

Question1:

A) **Distinguish among Spoilage, rework and scrap**

B) **"Normal Spoilage is planned Spoilage." Discuss**

4.2. Process Costing and Spoilage

A key issue in accounting for spoilage in process-costing systems is how to count spoiled units. As we have already discussed, units of abnormal spoilage should be counted and recorded separately. But what about units of normal spoilage? These units can either be counted (approach A) or not counted (approach B) when computing output units – actual or equivalent – in a process – costing system. Approach A leads to more accurate product costs because it makes visible the costs associated with normal spoilage and spreads costs because it makes visible the costs associated with normal spoilage and spreads it over good units. Approach B is less accurate because it spreads the costs of normal spoilage over all units. The following example and discussion illustrate the superiority of approach A over approach B.

Count All Spoilage

EXAMPLE 1: chipmakers, Inc, manufactures computer chips for television sets. All direct materials are added at the beginning of the production process. To highlight issues that arise with normal spoilage, we assume no beginning inventory and focus only on direct materials costs. In May 2000,$270,000 in direct materials were introduced into production. Production data for May indicate that 10,000 units were started, 5,000 good units were completed, and 1,000 units were spoiled (all normal spoilage). Ending work in process was 4,000 units (each 100% complete as to direct material costs) spoilage is detected upon completion of the process. The following exhibit reveals the two approaches.

Effect of Recognizing Equivalent units in spoilage for direct Materials costs
Chipmakers, Inc, for May 2000

	Approach A: Recognizing Spoiled Units When Computing Output In Equivalent Units	Approach B: Not Counting Spoiled Units When Computing Output In Equivalent Units
Costs to account for	$270,000	$270,000
Divide by equivalent units	÷ 10,000	÷ 9,000
Cost per equivalent unit	$ 27	$ 30
Assigned to		
Good units completed: 5,000 X $27;5,000X$30	$135,000	$150,000
Add normal spoilage: 1,000 X $27	27,000	0
Costs of good units transferred out	$162,000	$150,000
Work in process, ending:		
4,000 X$27;4,000 X$ 30	108,000	120,000
Costs accounted for	$270,000	$270,000

Spoilage is typically assumed to occur at the stage of completion where in section takes place. Why? Because spoilage is not detected until this point. In out example, spoilage is assumed to occur at the end of the process.

The direct materials unit costs are computed and assigned using approaches A and B in above exhibit. Not counting the equivalent units for normal spoilage decreases equivalent units, resulting in a higher cost of each good unit. A $30 equivalent unit cost (instead of a $27 equivalent –unit cost) is assigned to work in process that has not reached the inspection point. Simultaneously, the direct materials costs assigned to good units completed, which include the cost of normal spoilage, are understated ($150,000 instead

of $162,000). Consequently, the 4,000 units, in ending work in process contain costs of spoilage of $12,000 ($120,000 - $108,000) that do not pertain to those units and that, in fact, belong with the good units completed and transferred out. The 4,000 units and that, in fact, belong with the good units completed and transferred out. The 4,000 units in ending work in process undoubtedly include some units that will be detected as spoiled in the subsequent accounting period. The ending work in process is being in the next period when inspection occurs as the units are completed. In effect, under approach B, these units will bear two charges for spoilage. Such cost distortions do not occur when spoiled units are recognized in the computation of equivalent units. Approach A has a further advantage. It high lights the cost of normal spoilage to management and thereby focuses management's attention on reducing spoilage. Therefore, we will approach A to present process costing with spoilage.

The Five Step Procedure for Process Costing with Spoilage

Dear students! We illustrate process costing with spoilage using the following example

EXAMPLE 2: Anzio company manufactures a wooden recycling container in its forming Department. Direct materials for this product are introduced at the beginning of the production cycle. At the start of production, all direct materials required to make one output unit are bundled in a single kit. Conversion costs are added evenly during the cycle. Some units of this product are spoiled as a result of defects only detectable at inspection of finished units. Normally the spoiled units are 10% of the good output. Summary data for July 2000 are:

Physical Units for July 2000

Work in process beginning inventory (July 1)	1,500 units
Direct materials (100% complete)	
Conversion costs (60% complete)	
Started during July	8,500 Units
Completed and transferred out in July	7,000 good units
Work in process, ending inventory (July 31)	2,000 Units
Direct materials (100% complete)	

Conversion costs (50% complete)

Total Costs for July 2000

Work in process, beginning inventory		
Direct materials (1,5000 equivalent units X$8)	$12,000	
Conversion costs (900 equivalent units X$10)	9,000	$21,000
Direct materials costs added during July		76,500
Conversion costs added during July		89,100
Total costs to account for		$186,600

The five-step procedure for process costing used in the above section needs only slight modification to accommodate spoilage. The key change is in calculating the number of spoiled units in step 1.

Step 1: Summarize the Flow of physical Units of Output Identify units of both normal and abnormal spoilage. In our example, the number of spoiled units is computed as follows:

$$\text{Spoiled Units} = \left\{\begin{matrix}\text{beginning} \\ \text{Units}\end{matrix} + \begin{matrix}\text{Units} \\ \text{started}\end{matrix}\right\} - \left\{\begin{matrix}\text{Good units} \\ \text{transferred out}\end{matrix} + \begin{matrix}\text{Ending} \\ \text{units}\end{matrix}\right\}$$

$$= (1{,}500 + 8{,}500) - (7{,}000 + 2{,}000)$$

$$= 10{,}000 - 9.000$$

$$= 1{,}000 \text{ units}$$

Step2: Compute Output in Terms of Equivalent Units Compute equivalent units for spoilage in the same way as for good units. Following approach A, all spoiled units are included in the computation of output units. Because Anzio inspects at the completion point, the same amount of work will be done on each spoiled unit and each completed good unit.

Step 3: Compute Equivalent –Unit Costs The details of this step are similar to those in process costing system.

Step 4: Summarize total costs to Account For These are all the costs debited to work in process.

Step 5: Assign total costs to units completed, to spoiled units, and to Units in Ending work in process This step now includes computation of the cost of spoiled units and the cost of good units. The following exhibit illustrate Process Costing with Spoilage

Weighted- average method of process costing with spoilage

Forming Department of the Anzio company for JULY 2000

PANEL A: STRPS 1 AND 2 –SUMMARIZE OUTPUT IN PHYSICAL UNITS AND COMPUTE EQUIVALENT UNITS

Flow of Production	(Step 1) Physical Units	(step 2) Equivalent Units	
		Direct Materials	Conversion Costs
Work in process, beginning	1,500		
Started during current period	8,500		
To account for	10,000		
Good units completed and transferred			
Out during current period:	7,000	7,000	7,000
Normal spoilage[a]	700		
700X100%; 700X100%		700	700
Abnormal spoilage[d]	300		
300x100%; 300 X 100%		300	300
Work in process, ending[c]	2,000		
2,000 X100%;2,000X50%		2,000	1,000
Accounted for	10,000		
Work done o date		10,000	9,000

[a]Normal spoilage is 10% of good units transferred out: 10%X7,00 units. Degree of completion of normal spoilage in this department: direct materials, 100%; conversion costs, 100%

[b]Abnormal spoilage = Actual spoilage – Normal spoilage = 1,000 – 700 = 300 units. Degree of completion of abnormal spoilage in this department: direct materials, 100%; conversion costs, 100%.

[c]Degree of completion in this department: direct materials, 100% conversion costs, 50%

PANEL B: STRPS 3,4, AND 5- COMPUTE EQUIVALENT – UNIT COST
SUMMARIZE TOTAL COSTS TO ACCOUNT FOR, AND ASSIGN COSTS TO UNITS
COMPLETED, TO SPOILAGE UNITS, AND TO UNITS IN ENDING WORK IN PROCESS

		Total Production Costs	Direct Materials	Conversion costs
(Step3)	work in process, beginning	$ 21,000	$12,000	$9,000
	Costs added in current period	165,600	76, 500	89,100
			88,500	98,100
	Divide by equivalent units of work done to date		÷10,000	÷9,000
	Equivalent –unit costs of work done to date		$8.85	$10.90
(step 4)	TOTAL COSTS TO ACCOUNT FOR $186,600			
(setap5)	Assignment of cost			
	Good units completed and transferred out (7,000 units)			
	Costs before adding normal spoilage	$138,250	(7,000[d]X$8.85) +(7,000[d]X $ 10.90)	
	Normal spoilage (700 units)	13,825	(700[d] X $8.850 + (700[d]X$10.90)	
(A)	Total cost of good units completed & Transferred out	152,075		
(B)	Abnormal spoilage (300 units)	5, 925	(300[d]X$8.85) + (300[d]X$10.90)	
	Work in process, ending (2,000 units)			
	Direct materials	17,700	2,00[d] X $8.85	
	Conversion costs	10, 900	1,000[d] X$10.90	
(C)	Total work in process, ending	28,600		
(A) + (B) +)C)	Total costs accounted for	$186.600		

[d]Equivalent units of direct materials and conversion costs calculated in step 2 in panel A above.

Weighted – Average method and spoilage

The above Exhibit, Panel A, presents steps 1 and 2 to calculate equivalent units of work done to date and includes calculations of equivalent units of normal and abnormal spoilage. And panel B, presents steps 3, 4, and 5 (together called the production cost worksheet). Step 3 presents the equivalent –unit cost calculations using the weighted –

average method. Note how, for each cost category, the costs of beginning work in process and costs of work done in the current period are totaled and divided by the equivalent units of all work done to date to calculate the weighted average cost. Step 4 summarizes the total costs to account for. Step 5 assigns costs to completed units, spoiled units, and ending inventory by multiplying the equivalent units calculated in step 2 by the cost per equivalent unit calculated in step 3. Note how the costs of normal spoilage, $13,825, are added to the costs of their related good units. Hence, the cost per good unit completed and transferred out of the process equals the total costs transferred out (including the costs of normal spoilage) divided by the number of good units produced, $152,075÷7,000 = $21.725. It is not equal to $19.75, which is the sum of the costs per equivalent unit of direct materials ($8.85) and conversion costs ($10.90)

Instead, the cost per good unit is equal to the total cost of direct materials and conversion costs per equivalent unit, $19,75, plus a share of the normal spoilage $1.975 ($13,825 ÷ 7,000) = $21.725. The $5,925 costs of abnormal spoilage are assigned to the loss from Abnormal Spoilage account and do not appear in the good –unit costs.

FIFO Method and Spoilage

Panel A of the above exhibit, presents steps 1 and 2 using the FIFO method that focuses on equivalent units of work done in the current period. panel B, on the other hand, presents steps 3, 4, and 5. Note how the FIFO method keeps the costs of the beginning work- in- process inventory separate and distinct from the costs of work done in the current period when assigning costs. All spoilage costs are assumed to be related to units completed during this period, using the unit costs of the current period.

4.3. Job Costing and Spoilage

The concepts of normal and abnormal spoilage also apply to job –costing systems. Abnormal spoilage is usually regarded as controllable by the manager. It is separately identified with the goal of eliminating it altogether. Costs of abnormal spoilage are not considered as inventoriable costs and are written off as costs of the period in which detection occurs. Normal spoilage costs in job-costing systems (just as in process –

costing systems) are inventoriable costs, although increasingly managements are tolerating only small amounts of spoilage as normal. When assigning costs, job –costing systems generally distinguish between normal spoilage attributable to a specific jib and normal spoilage common to all jobs. Normal spoilage attributable to a specific job is assigned to that job, a step unnecessary in process costing since masses of identical or similar units are manufactured.

Dear students! We illustrate the accounting for spoilage in job costing using the following example.

EXAMPLE 3: In the Hull Machine shop, 5 aircraft parts out of a job lot of 50 aircraft parts are spoiled. Costs assigned prior to the inspection point are $2,000 per part. Hull calculates these costs on the basis of its inventory costing assumptions – weighted – average, FIFO, or standard costs. We do not, however, emphasize cost-flow assumptions in our presentation here or in subsequent sections. The current disposal price of the spoiled parts is estimated to be $6000 per part. When the spoilage is detected, the spoiled goods are inventoried at $600 per part.

Normal spoilage attributable to a specific job when normal spoilage occurs because of the specification of a particular job, that job bears the cost of the spoilage reduced by the current disposal value of that spoilage. The journal entry to recognize the disposal value of the normal spoilage (items in parentheses indicate subsidiary ledger postings) is:

Materials Control (spoiled goods at current disposal value): 5X$600	3,000	
Work – in – process Control (specific job): 5 X $600		3,000

Note that the work –in-process control (specific job) has already been debited (charged) $ 10,000 for the spoiled parts (5 spoiled parts X$2,000 per part). The effect of the $3, 000 becomes an additional cost of the 45 (50 -5) good units produced. The total cost of the 45 good units is $97,000, $90,000 (45 units X$2,000 per unit) incurred to produce the good units plus the $7,000 net cost of normal spoilage.

Normal spoilage common to all jobs in some cases, spoilage may be considered a normal characteristic of a given production cycle. The spoilage inherent in production only coincidentally occurs when a specific job is being worked on. The spoilage then is not attributable, and hence is not charged, to the specific job, in stead, it is costed as manufacturing overhead.

The journal entry is:

Materials control (spoiled goods at current disposal value): 5 X $600	3,000	
Manufacturing overhead control (normal spoilage): ($10,000 - $ 3, 000)	7,000	
Work –in –process Control (specific job): 5 X$ 2,000		10,000

When normal spoilage is common to all jobs, the budgeted manufacturing overhead rate includes a provision for normal spoilage cost. Therefore, normal spoilage cost is spread, through overhead allocation, over all jobs rather than loaded on particular jobs only. the total cost of the 45 good units is $90,000 (45 units X$2,000 per unit) incurred to produce the good units plus a prorated share of the $7,000 of normal spoilage overhead costs.

Abnormal spoilage If the spoilage is abnormal, the net loss is highlighted and always charged to an abnormal loss account. Unlike normal spoilage costs, abnormal spoilage costs are not included as a part of the cost of good units produced. The total cost of the 45 good units is $90,000 (45Units X$2,000 per unit).

Materials Control (spoiled goods at current disposal value): 5 X $600	3,000	
Loss from Abnormal Spoilage: ($ 10,000 - $3,000)	7,000	
Work –in-process control (specific job): 5 x $2,000		10,000

Even though, for external reporting purposes, abnormal spoilage costs are written off in the period and are not linked to specific jobs or units, companies often identify the specific reasons for abnormal spoilage, and, where appropriate, link abnormal spoilage with specific jobs or units for cost management purposes.

4.4. Rework

Rework is unacceptable units of production that are subsequently repaired and sold as acceptable finished goods. For rework, we again distinguish (1) normal rework attributable to a specific job, (2) normal rework common to all jobs, and (3) abnormal rework.

Consider the Hull machine Shop data (Example 3). Assume that the five spoiled parts used in our illustration are reworked. The journal entry for the $10,000 of total costs (details of costs assumed) assigned to the five spoiled units be fore considering rework costs are as follows:

Work-in- process control (specific job)	10,000	
Materials Control		4,000
Wages Payable Control		4,000
Manufacturing Overhead Allocated		2,000

Assume that rework costs equal $3,800 (direct materials, $800: direct manufacturing labor, $2,000; manufacturing overhead, $1,000).

Normal rework attributable to a specific job If the rework is normal but occurs because of the requirements of a specific job, the rework costs are charged to that job. The journal entry is as follows:

Work –in-process control (specific job)	3,800	
Materials Control		800
Wages payable control		2,000
Manufacturing overhead Allocated		1,000

Normal rework common to all jobs when rework is normal and not attributable to any specific job, the costs of rework are charged to manufacturing overhead and spread, through overhead allocation, over all jobs.

Manufacturing Overhead Control (rework costs)	3,800	
Materials Control		800
Wages payable control		2,000
Manufacturing Overhead Allocated		1,000

Abnormal rework if the rework is abnormal, it is recoded by charging abnormal rework to a separate loss account.

Loss from Abnormal Rework	3,800	
Materials control		800
Wages Payable Control		2,000
Manufacturing Overhead Allocated		1,000

Accounting for rework in a process-costing system also requires abnormal rework to be distinguished from normal rework. A process –costing system accounts for abnormal rework in the same way as a job costing system. Accounting for normal rework follows the accounting described for normal rework common to all jobs (units) because masses of identical or similar units are manufactured in process costing systems.

Costing rework highlights to managers the resources wasted on activities that would not have to be undertaken if the product were made correctly. It prompts managers to seek ways to reduce rework, for example, by designing new products or processes, training workers, or investing in new machines. Calculating rework costs helps managers perform cost-benefit analyses for various alternative ways to reduce or eliminate rework. To emphasize the importance of eliminating rework and to simplify the accounting, some companies set a standard of zero rework. All rework is then treated as abnormal and written off as a cost of the current period.

Timeout! Have you understood the accounting process for normal and abnormal spoilage both under process costing and job costing? Good! Now let's do the following exercise:

Activity:
Question2: RST Textiles has some spoiled goods that had an assigned cost of $40,000 and zero net disposal value.
Required: prepare journal entries for each of the following conditions under (a) process costing and (b) job costing

1. abnormal spoilage of $40,000
2. Normal spoilage of $40,000 related to the general plant operations.
3. Normal spoilage related to specifications of a particular job.

4.5. Accounting for Scrap

Scrap is material left over when making a product(s); it has low sales value compared with the sales value of the product(s). There are no distinctions of normal and abnormal scrap. But scrap attributable to a specific job is distinguished from scrap common to all jobs.

There are two major aspects of accounting for scrap:

1. Planning and control, including physical tracking
2. Inventory costing, including when and how to affect operating income

Initial entries to scrap records are most often in physical terms. In various industries, items such as stamped –out metal sheets or edges of molded plastic parts are quantified by weighing, counting, or some other expedient means. Scrap records not only help measure efficiency, but also control what is often a tempting source for theft. Scrap reports are prepared with the budgeted or standard amounts. Scrap is either sold or disposed of quickly, or stored for later sale, disposal, or reuse.

Careful tracking of scrap often extends in to the accounting records. For example, in one survey, 60% of the companies maintained a distinct account for scrap costs somewhere in their accounting system. The issues here are similar to those discussed in unit 5 regarding the accounting for byproducts:

1. When should the value of scrap be recognized in the accounting records – at the time scrap is produced or at the time scrap is sold?
2. How should revenue from scrap be accounted for?

To illustrate, we extend our hull example assuming that the manufacture of aircraft parts generates scrap. We further assume that the scrap from a job has a total sales value of $900.

4.5.1. Recognizing Scrap at the Time of Its Sale

When the dollar amount of scrap is immaterial, the simplest accounting is to make a memo of the quantity of scrap returned to the storeroom and to regard scrap sales as a separate line item of other revenues. The only journal entry is:

Sale of scrap:	Cash or Accounts Receivable	900	
	Sales of Scrap		900

When the dollar amount of scrap is material and the scrap is sold quickly after it is produced, the accounting depends on whether the scrap is attributable to a specific job or common to all jobs.

Scrap attributable to a specific job Job-costing systems sometimes trace the sales of scrap to the jobs that yielded the scrap. This method is used only when the tracing can be done in an economically feasible way. The journal entry is:

Scrap returned to storeroom:	No journal entry.		
	[Memo of Quantity received and related		
	Job is entered in the inventory record]		
Sale of scrap:	Cash or Accounts Receivable	900	
	Work-in-process Control		900
	Posting made to subsidiary ledger – "Sales		
	Of scrap" column on department cost record.		

This method does not link scrap with any particular job or product. Instead, all products bear regular production costs without any credit for scrap sales except in an indirect manner: the expected sales of scrap are considered when setting the budgeted manufacturing overhead rate. Thus, the budgeted overhead rate is lower than it would be if the overhead budget has not been reduced by expected sales of scrap. This accounting for scrap is used in both process-costing and job –costing systems .

4.5.2. Recognizing Scrap at the Time of its Production

Our preceding illustrations assume that scrap returned to the storeroom is sold quickly and hence not assigned an inventory cost figure. Sometimes, however, as is the case with edges of molded plastic parts, the value of scrap is not immaterial, and the time between

storing it and selling or reusing it can be quite long. Under these conditions, the company is justified in inventorying scrap at a conservative estimate of net realizable value so that production costs and related scrap recovery are recognized in the same accounting period. Some companies tend to delay sales of scrap until the market price is most attractive. Volatile price fluctuations are typical for scrap metal. If scrap is inventoried, it should be recorded at some "reasonable value" – a challenging task in the face of volatile market prices.

Scrap attributable to a specific job The journal entry in the Hull Machine shop example is:

Scrap returned to storeroom:	Materials Control	900	
	Work-in-process Control		900

Scrap common to all jobs The journal entry in this case is

Scrap returned to storeroom:	Materials Control	900	
	Manufacturing overhead control		900
Sale of scrap:	Cash or Accounts Receivable	900	
	Materials Control		900

Scrap is sometimes reused as direct materials rather than sold as scrap. In this case, it should be debited to Materials Control as a type of direct materials and carried at its estimated net realizable value. For example, the entries when the scrap generated is common to all jobs are:

Scrap returned to storeroom:	Materials Control	900	
	Manufacturing Overhead Control		900
Reuse of scrap:	work-in-process control	900	
	Materials control		900

The accounting for scrap under process costing is like the accounting under job costing when scrap is common to all jobs because process costing applies to the manufacture of masses of identical or similar units.

The high cost of scrap focuses managers` attention on ways to reduce scrap and to use it more profitably. For example, General Motors Corporation has redesigned its plastic injection molding processes to reduce the scrap plastic that must be broken away from its

molded products. General Motors also regrinds and reuses the plastic scrap as direct material, saving substantial input costs.

Timeout! Have you grasped the accounting for scrap and spoilage? Good! Let us do the following activity:

Activity :
Question3:

A) **How do managers use information about scrap**

B) **What has been regarded as normal spoilage in the past is not necessarily acceptable as normal spoilage in the present or future. Explain**

4.6. Chapter Summary

We have seen the general accounting structure in relation with spoilage, rework and scrap. Spoilage is units of production—whether fully or partially completed—that do not meet the specifications required by customers for good units and that are discarded or sold at reduced prices.

Rework is units of production that do not meet the specifications required by customers but that are subsequently repaired and sold as good finished units. Scrap is residual material that results from manufacturing a product. Examples are short lengths from woodworking operations, edges from plastic molding operations, and frayed cloth and end cuts from suit-making operations.

There are two types spoilage Normal spoilage and abnormal spoilage. Normal spoilage is spoilage inherent in a particular production process. In particular, it arises even when the process is operated in an efficient manner. The costs of normal spoilage are typically included as a component of the costs of good units manufactured, because good units cannot be made without also making some units that are spoiled. Abnormal spoilage is spoilage that is not inherent in a particular production process and would not arise under efficient operating conditions.

The concepts of normal and abnormal spoilage also apply to job-costing systems. Abnormal spoilage is separately identified so companies can work to eliminate it altogether. Costs of abnormal spoilage are not considered to be inventoriable costs and are written off as costs of the accounting period in which the abnormal spoilage is detected. Normal spoilage costs in job-costing systems as in process-costing systems are inventoriable costs, although increasingly companies are tolerating only small amounts of spoilage as normal. When assigning costs, job-costing systems generally distinguish normal spoilage attributable to a specific job from normal spoilage common to all jobs.

Rework is units of production that are inspected, determined to be unacceptable, repaired, and sold as acceptable finished goods. We again distinguish (1) normal rework attributable to a specific job, (2) normal rework common to all jobs, and (3) abnormal rework.

4.7. Self test Questions

Work out Question

ABC Electronics Company has two departments to manufacture computers, Assembly and testing departments. First component parts are assembled in assembly department and then transferred out to testing department. Direct materials are added some where in between the assembly process but conversion costs are added evenly through out the assembly process. The company uses process costing system. The following data are for the month of January for assembly department.

	Physical units	Direct material	Conversion cost
Beginning WIP	400	$2,484,000	$464,000
Started in the month	2,500		
Completed units	2,300		
Cost added during the month		16,100,000	6,960,000

Additional information

- There are 200 spoiled units 50% of which is abnormal
- Degree of completion –Beginning WIP
    - Direct material (90% complete)
    - Conversion cost (40% complete)

- Degree of completion –Ending WIP
    - Direct material (60% complete)
    - Conversion cost (30% complete)

Requirements: Under FIFO method

a) Summarize the flow of physical units
b) Compute equivalent unit in terms of each cost
c) Compute cost per equivalent unit
d) Assign the cost to units completed and WIP ending
e) Pass the necessary journal entries

CHAPTER FIVE: INCOME EFFECT OF ALTERNATIVE PRODUCT COSTING METHODS

Learning objectives:

Dear students, after completing this chapter you should be able to:

- ☞ Explain absorption costing and variable costing
- ☞ Distinguish what costs are inventoried (assigned to products) under each technique.
- ☞ Compare the two costing techniques
- ☞ Develop income statements under absorption costing and variable costing
- ☞ Reconcile Variable costing and Absorption costing.

5.1. Introduction

The elements of costs (materials, labor and expenses) each broadly are put into two categories; fixed costs and variable costs. Dear learner! As we already discussed in our module one of unit two, fixed costs are those costs, which do not vary in total but remain constant within a given period of time and range of activity in spite of fluctuations in production, however, varies per unit of production. The examples of fixed costs are rent, insurance charges, management salaries, etc. On the other hand, variable costs are costs, which vary in total, in direct proportion to any change in the volume of output but remain constant per unit of activity or production. The costs of direct materials, direct wages etc can be put into this category. The cost of a product or process can be ascertained using the different elements of cost according to any of these two techniques: Absorption costing and Variable costing.

In this unit, you will learn how cost of products is determined using absorption costing technique and variable costing technique, comparison between absorption and variable costing and reconciliation of variable and absorption costing. These techniques basically differ in consideration of variable and fixed costs in determination of product cost. At the end, it is our hope you will obtain and acquire more knowledge on the essentials of

product cost determinations using absorption costing and variable costing techniques, and their basic differences.

5.2. Absorption and Variable Costing

Dear student, income is one of the many important measures used to evaluate the performance of both segments and entire companies. There are two alternative methods for reporting income in several firms, depending on the accounting treatment of fixed and variable overheads. In this unit we will examine these two income-reporting alternatives (techniques), called absorption (full) costing and variable (marginal) costing.

Products costs – in the products-costing systems we have studied in unit four and five of this module, that manufacturing overhead is applied to Work-in process Inventory as a product cost along with direct material and direct labor costs. When the manufactured goods are finished (completed), these product costs flow from Work-in process Inventory into Finished-Goods Inventory. Finally, during the accounting period when the goods are sold, the product costs flow from Finished Goods Inventory in to cost of goods sold, and then to expense account. Accordingly, our main concern here is how fixed and variable costs are treated in the determination of product costs and income and the discussion is presented in detail as follows.

5.2.1. Absorption Costing

Absorption costing technique is also known as traditional or full cost method. According to this method the cost of a product is determined after considering both Fixed and variable costs. In our study of product-costing systems, we included both variable and fixed manufacturing overhead in the products costs that flow through the manufacturing accounts in addition to direct costs. This approach to product costing is called absorption costing (or full costing), because all manufacturing –overhead cost are applied to (or

absorbed by) manufactured goods. The variable costs, such as those of direct materials, direct labor etc., are directly charged to the products while the fixed costs are apportioned on a suitable basis over different products manufactured during the period.

Thus, in case of absorption costing all costs are identified with the manufactured products. Absorption costing is the generally accepted method of product costing for purposes of external reporting.

Absorption costing which do not recognize the difference between fixed costs and variable costs does not adequately cater to the needs of Management. The statement prepared under absorption costing do elaborately explain past profits, past loses and the cost incurred in past, but these statements do not help when it comes to predict about tomorrow's result. A conventional income statement cannot tell what the profit or loss will be, if the volume is increased or decreased. These days, there is a cut- throat competition in market and management has got to know its cost structure thoroughly. Absorption costing (marginal costing) provides this vital information to management and it helps in the discharge of its function like cost control, profit planning, performance evaluation and decision-making.

Activity:
Question1: What we mean by absorption costing?
_____

5.2.2. Variable Costing

Variable costing is a technique where only the variable costs are considered while computing the cost of a product. The fixed costs are met against the total fund arising out the excess of selling price over total variable cost. This fund is known as "contribution" in marginal costing.

The alternative approach, variable costing, in which only variable manufacturing overhead is applied to Work-in-Process Inventory as a product cost in addition to direct costs. Fixed manufacturing overhead costs are expensed as they are incurred.

Dear learner, the distinction involves the timing with which fixed manufacturing overhead become an expense. Eventually, fixed overhead is expensed under both product-costing systems. Under variable costing, however, fixed overhead is expensed immediately, as it incurred. Under absorption costing, fixed overhead is inventoriable until the accounting period during which the manufactured goods are sold.

The main controversy between the two methods centers on what costs should be inventoried (assigned to products). Absorption costing advocates believe that all necessary costs of production should be included in product cost direct and indirect, fixed and variable costing advocates, on the other hand, maintain that a cost should be inventoried only if incurring the cost now eliminates the necessity of incurring if in the future.

A variable costing income statement highlights cost behavior characteristics. It provides managers with information about the effect on costs and profits of changes in the volume of activity. Comparing variable costs with revenue provides contribution margin information. Variable costing is one of several reporting methods generally classified as contribution approach reporting.

Activity:
Question2: Define what is variable costing?

5.2.3. Comparison Between Absorption and Variable Costing

Having read the above details in relation to both techniques (absorption costing and variable costing), we can list down the following differences in a summarized way as below:

Under absorption costing	Under Variable costing
1. Both fixed cost and variable cost are considered for product costing and inventory valuation	1. Only variable cost is considered for product costing and inventory valuation.
2. The fixed cost is charged to cost of production. Each product is to bear a reasonable share of fixed cost and profitability of product is thus influenced by subjective apportionment of fixed overheads.	2. Treatment of fixed overhead is different. Fixed cost is considered period cost and profitability of different products is fudged by profit volume rate.
3. The presentation of cost data is on conventional pattern. Net Profit of each product is determined after deducting fixed overhead	3. Presentation of data is oriented to highlight the total contribution and contribution from each product.
4. The difference in the magnitude of opening stock and closing stock affects the unit cost of production stock affects the unit cost of production due to the impact of related fixed overheads.	4. The difference in the magnitude of opening stock and closing stock does not affect the unit cost of production.

Unit Cost Computations

To illustrate the computation of unit product costs under both absorption and variable costing, consider Boley Company, a small company that produces a single product and that has the following cost structure:

Illustration 5.1 – Absorption and Variable Costing

Number of units produced each year 6,000
Variable costs per unit:
Direct materials $2
Direct labor $4
Variable manufacturing overhead . . . . . $ 1
Variable selling and administrative expenses $3
Fixed costs per year:
Fixed manufacturing overhead $30,000
Fixed selling and administrative expenses $10,000

Required:

1. Compute the unit product cost under absorption costing.
2. Compute the unit product cost under variable costing

Solution

Absorption Costing

Direct materials . . . . . $ 2
Direct labor 4
Variable manufacturing overhead 1
Total variable manufacturing cost 7
Fixed manufacturing overhead ($30,000 / 6,000 units of product) 5
Unit product cost $12

Variable Costing

Direct materials . . . . . $ 2
Direct labor 4
Variable manufacturing overhead 1
U nit product cost $7

(Under variable costing, the $30,000 fixed manufacturing overhead is a period expense along with selling and administrative expenses.)

Under the absorption costing method, *all* manufacturing costs, and variable and fixed, are included when determining the unit product cost. Thus, if the company sells a unit of product and absorption costing is being used, then $12 (consisting of $7 variable cost and $5 fixed cost) will be deducted on the income statement as cost of goods sold. Similarly, any unsold units will be carried as inventory on the balance sheet at $12 each. Under the variable costing method, only the variable manufacturing costs are included in product costs. Thus, if the company sells a unit of product, only $7 will be deducted as cost of goods sold, and unsold units will be carried as inventory on the balance sheet at only $7 each.

Format of Absorption costing Income statement

Sales ---------- XX
Cost of goods sold
Direct material ---------- xx
Direct labor ---------- xx
Variable MOH ---------- xx

Fixed MOH ---------- xx XX
Gross profit ---------- XX
Variable operating expense --------xx
Fixed operating expense ---------- xx
Operating income ---------- XX

Format of direct costing income statement

Sales revenue ---------- XX
Variable cost
Direct material ---------- xx
Direct labor ---------- xx
Variable MOH ----------xx
Variable expense ---------- xx XX
Contribution margin ---------- XX
Fixed MOH cost ---------- XX
Fixed operating expense ----------XX
Operating income ---------- XX

Illustration 5–2 displays income statements prepared under the absorption and variable costing approaches for the year 2006.In preparing these statements, we use the data for Boley Company presented earlier, along with other information about the company as given below:

Units in beginning inventory 0
Units produced. 6,000
Units sold 5,000
Units in ending inventory 1,000
Selling price per unit . . . . . …. . . . $20
Selling and administrative expenses:
Variable per unit . . . . . ……... . $3
Fixed per year . . . . . …..... $10,000

Boley Company
Income statement
For the year ended 2006

Absorption Costing

Sales (5,000 units × $20 per unit) $100,000
Cost of goods sold:
Beginning inventory . . . . . $ 0
Add cost of goods manufactured
(6,000 units x $12 per unit) 72,000
Goods available for sale 72,000
Less ending inventory
(1,000 units x $12 per unit) **12,000**

Cost of goods sold	60,000
Gross margin	40,000
Selling and administrative expenses: (5,000 units x $3 per unit variable + $10,000 fixed)	25,000
Net operating income	$ 15,000

Boley Company
Income statement
For the year ended 2006

Variable Costing

Sales (5,000 units x $20 per unit)		$100,000
Variable expenses:		
Variable cost of goods sold:		
Beginning inventory	$ 0	
Add variable manufacturing costs (6,000 units x $7 per unit)	42,000	
Goods available for sale	42,000	
Less ending inventory (1,000 units x $7 per unit)	**7,000**	
Variable cost of goods sold	35,000	
Variable selling and administrative expenses (5,000 units x $3 per unit)	15,000	50,000
Contribution margin		50,000
Fixed expenses:		
Fixed manufacturing overhead	30,000	
Fixed selling and administrative expenses	10,000	40,000
Net operating income		$ 10,000

5.3. Chapter Summary

Variable costing and absorption costing differ in only one basic respect i.e. how to account for fixed manufacturing costs. Under variable costing, fixed manufacturing costs are excluded from inventoreable costs and are a cost of the period in which they are incurred. Thus, only variable manufacturing costs are inventoried in this method. Under absorption costing method, all variable manufacturing and all fixed manufacturing costs

are included as inventoreable costs and become a part of cost of goods sold in the period when sales occur.

The variable –costing income statement is based on the contribution-margin format. The contribution margin in this case is measured as the deference between revenue of the period and both variable manufacturing and variable non manufacturing costs. The absorption-costing income statement is based on the gross-margin format. The gross margin is measured as the difference between the revenue of the period and cost of goods sold.

Under variable costing, reported operating income is driven by the unit level of sales. Under absorption costing, reported operating income is driven by the unit level of production as well as by the unit level of sales.

Managers can increase operating income when absorption costing is used by producing more units. Critics of absorption costing label this potential outcome as the major negative consequence of treating fixed manufacturing overhead as an inventoreable cost.

The effect of changes in unit inventory levels on operating income is such that:

i) If production and sales of a given period are equal, then operating income reported under both variable and absorption method will be equal.
ii) If production of a period is greater than the sales of the period, then, lower operating income will be reported by variable costing method than absorption costing method.
iii) If production of a given period is less than sales of that period, then higher operating income will be reported by variable product costing method than absorption product costing method.

5.4. Self-Test Questions

1. Marginal (Variable) costing is not used for external reporting purpose. Do you agree? Explain in detail.

2. What effect do fluctuating fixed and variable production costs have on the difference on the net income between Marginal and Total (full) costing? Explain supporting with examples.
3. What are the basic points that should be considered in comparison of the income statements under absorption costing and variable costing?
    - ✓ This because, under absorption costing a portion of fixed cost relating to the previous year is changed to current period.

Work out question

The following information relates to the operation of Sanfransisco Company for the year 2004.

Selling price	$20
Units produced	10,000
Unit sold	8,000
Total DM cost	$40,000
Total DL cost	$20,000
Total VMOH cost	$60,000
Total FMOH cost	$25,000
V. marketing expense	$4,500
F.marketing expense	$25,000

Required:

1. prepare income statement using Absorption costing
2. prepare income statement using Direct costing

CHAPTER SIX: COST ALLOCATION

Learning objectives:

Dear students, after completing this chapter you should be able to:

- ☞ to understand the purpose of overhead rates
- ☞ to select base to calculate overhead application rate
- ☞ to determine the applied cost using the overhead application rate

6.1. Introduction

After manufacturing overhead cost have been accumulated by departments, they must be allocated to jobs or departments. In this unit you will learn how the cost accountant selects bases for allocating the departmentalized overhead costs to specific units of production.

6.2. Purpose Overhead Rates

Management cannot wait until the end of the year, or even until the end of the month, to find out how much a particular job costs. Cost data are most useful when they are immediately available. They can then be used to evaluate efficiency, to suggest changes in procedure and to help in setting profitable selling price.

The cost accountant is usually expected to support the total cost of a job as soon as it is finished. At this time the actual total overhead cost are not available, as they would be at the end of a fiscal period. For example – various bills such as telephone or utility bills, may not arrive before a job is completed. The accountant must device a method rapidly and reliable to estimate the overhead costs applicable to the completed job. Since these costs are not yet fully known, predetermined overhead rates are used for estimating overhead costs.

6.3. Determining the Overhead Rates

The basic procedure for determining an overhead rate is quite simple. First a relationship is formed between the company's total overhead costs and some second factor or basis

that relates to the overhead costs of the job in a realistic way. The basis must also be accurately measurable.

The basis for allocating overhead might be an amount or quantity, such a direct labor costs, material costs, or direct labor hours. The ratio between the total overhead costs and the basis, expressed as a percent is called the **overhead application rate**.

A small plant with only one or a few similar departments manufacturing very few types of goods may successfully use a single common rate for the entire factory. However, if several different types of product are manufactured, or if all product do not go through all departments, a single rate is not appropriate. Nor is a single rate suitable if some departments perform largely machine operation and other departments use primarily hand labor. In such a case, a separate rate must be used for each of the producing departments.

Activity :
Question 1: what is the purpose over head rate ?

6.4. Types of Overhead Rate Bases

The primary purpose of using predetermined overhead rates is to charge a fair share of overhead costs to each job. A number of basis for determining overhead rates may be used in computing factory wide rates and in setting departmental rates. The most common basis are the following:

- unit of production
- Material costs
- Machine hrs
- Direct labor hrs
- Direct labor cost

The cost and production figures used in the calculation are usually derived from budget estimate

The following budgeted data are extracted

From Zenu House hold producing enterprise

- Manufacturing overhead costs for the year $ 96,000
- Number of units of production in the year 24,000 units
- Direct material costs for the year $ 470,000
- Direct machine hrs for the year 11,000
- Direct labor hrs for the year 38,000
- Direct labor costs for the year $198,000

6.4.1. Unit of Production Method

Overhead may be applied on the basis of the number of units manufactured during the period. The estimated manufacturing overhead cost is divided by the estimated total number of units of production to get the overhead to be applied to each units of production.

$$\frac{\text{Estimated manufacturing overhead cost}}{\text{Estimated units of production}} = \text{overhead cost par unit of production}$$

$$= \frac{\$96,000}{24,000} = 4 \text{ per unit}$$

If a job of 2500 units were produced, the overhead applied to the job would be

(2500 X $4) = $10,000

Unfortunately, the unit of production basis has limited application. The rate is meaningful only if the manufacturing process is a simple one and only if one type or a few very similar types of goods are produced. For example product X requires 20 hrs. to be produced and product Y requires 2 hrs, it would be in appropriate to base overhead on units of production. Product X obviously going to require more overheads.

6.4.2. Material Cost Basis

Overhead may be applied on the basis of the cost of direct materials used to produce the product. The estimated manufacturing overhead cost are divided by the estimated direct material

$$\frac{\text{Estimated manufacturing overhead cost}}{\text{Estimated direct material cost}} = \text{percentage of material cost}$$

$$= \frac{\$96,000}{\$470,000} = 20\%$$

If direct materials consumed on a specific job cost $ 22,000, the overhead applied to the job would be (22,000 X 20%) = 4400

For material cost to make a good rate base each article manufactured must require approximately, the same amount of material or material usage must be distributed uniformly through the manufacturing process. In practice, most overhead cost bear little relationship to materials used, there for this base in rarely used.

6.4.3. Machine Hours Basis

Overhead may be applied as a rate for each machine hrs when work is performed primarily by machines. A large part of the manufacturing overhead costs consists of depreciation, power, repair, and other costs associated with machinery. Thus a logical relation ship exists between the use of the machinery and the amount of cost incurred. To determine this busies, divide the estimated manufacturing overhead cost by the estimated number of machine hours to get the rate for each machine hour.

$$= \frac{\text{Estimated manufacturing overhead cost}}{\text{Estimated machine hrs}} = \text{Rate per machine hrs}$$

$$= \frac{96,000}{11,000} = \$8.7 = \text{rate per machine hrs}$$

If a job requires 500 machine hrs, the overhead applied would be $8.7 X 500 = $4350
In a highly automated factory where machine perform most of the labor and each time goes through a similar sequence of machinery, this basis makes since. However, a machine hrs basis is not a curate if differ]rent kinds of machine are used for various

products. In such case, variation in original cost, operation cost, machine speed, and labor cost would make this rate in appropriate as an overall formula. A further objection to this method is the additional clerical work required to keep record of the number of machine hrs used on the job.

6.4.4. Direct Labor Hours Basis

Overhead may be applied as a rate for each direct labor hours. This widely used method assumes that overhead costs tend to vary with the number of hours of direct labor used.

The estimated manufacturing overhead costs are divided by the estimated number of direct labor hours to obtain an application rate for each hours.

$$= \frac{\text{Estimated manufacturing overhead cost}}{\text{Estimated direct labor hrs}} = \text{Rate per machine labor hrs}$$

$$= \frac{96{,}000}{38{,}000} = \$2.53 =$$

If a job required 2455 direct labor hrs to be completed the overhead applied would be.

(2455 X 2.53) = $6211.15

The direct labor hors basis is usually appropriate if labor operations are a major part of the production process and the wage rates paid different workers vary considerably. As a general rule there is correlation between total manufacturing overhead costs and the number of direct labor hors worked.

However, the direct labor hrs method requires a record of the number of direct labor hours spent on each day, which may necessitate additional record keeping. Total labor costs are part of the company record, but separate computation of total hrs is not typically made.

6.4.5. Direct Labor Cost Basis

Overhead may be applied as a percentage of cost of direct labor. This method is the most widely used overhead application basis because it is simple and easy to use. Information

concerning direct labor cost of each department and each job is available from the payroll record and the time tickets.

The estimated manufacturing overhead cost is divided by the estimated direct labor costs. This calculation results in the percentage of direct labor costs.

$$= \frac{\text{Estimated MOH}}{\text{Estimated direct labor}} = \text{Percentage of direct labor Costs}$$

$$= \frac{96{,}000}{198{,}000} = \$48\%$$

If the direct labor costs incurred on a particular job totaled $5750, the applied overhead would be ($5750 X 48%)=$2760.

The direct labor costs basis is not generally used in cases where a large proportion of overhead costs reflect to the use of machinery.

6.5. Selecting Overhead Basis

The following guideline should be used in order to select the overhead basis

- The rate must be easily computed
- The factor chosen as the basis must be one that can easily be measured for each job.
- There must be some direct relationship between the amount of overhead costs incurred and the factor chosen as a basis.
- The basis should be representative of the overhead costs applicable to each unit
- Department rates should be used if possible. As a result a number of different basis many be selected to meet the needs of different departments.

Activity:

Question 2: list at least the three types of overhead rate bases

6.6. Chapter Summary

Management needs cost information as soon as a job is finished. Instead of waiting for the end of a fiscal period when the actual cost totals are available, the cost accountant estimates overhead cost for each job. There are five types of overhead rates basis used for cost estimating: Unit of production, material costs, machining hours, direct labor hrs, and direct labor cost. The direct labor cost basis is used by most of manufacturing enterprise. Whatever basis is used the application rate is determined by dividing the estimated overhead costs by the basis chosen. The figure for the application rate is obtained from budget estimates.

6.7. Self-Test Questions

7. List the types of overhead cost allocation basis----------
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   ---
8. What are the basis to select (choose) the logical cost allocation basis?----------
   ---

   ---
9. Why are estimated (budgeted) overhead application rate used instead of actual overhead application rates? ----------
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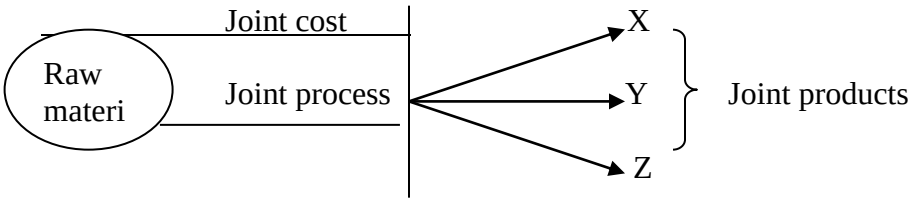
CHAPTER SEVEN: COST ALLOCATION-JOINT PRODUCTS AND BY PRODUCTS

Learning objectives:

Dear students, after completing this chapter you should be able to:

- ☞ explain and understand about joint products and joint cost
- ☞ handle the different methods used in allocating joint cost
- ☞ understand and explain by products

In this unit, we consider the complex case in which companies' produce two or more products simultaneously out of the same process or processes and from the same input. Many natural resource and agricultural companies and other industries face the problem of how to use cost information to manage processes that can produce different products. Companies that are engaged in wood processing, Shell oil Company which produce petroleum and chemicals; Coal and mineral producing companies, food processing industries (meat, milk etc), and many others are encountering such problems.



Split-off point

E.g. -Distillation of coal, yields coke, natural-gas, and other products

Before we discuss the main concepts and cost allocations to the joint products using several approaches, we should see first the basic terms that are commonly used in joint cost allocation system.

Joint Process: is a single production process that converts a common input into several inputs.

For example, processing timber results jointly in lumber of various grades plus wood chips and sawdust that can be converted into paper pulp. Another example is processing

crude oil can result jointly in gasoline of various grades, Kerosene, jet fuel, asphalt, and/or petrochemicals.

Joint costs: are the costs of a single production process that yields products simultaneously.

Joint products: are the products that jointly result from processing a common in put and that have relatively the same sales value. We can think of the examples given under the joint process. Or X, Y, and Z are joint products.

The split off point:-is the juncture or the point in a joint production process where one or more products become separately identifiable.

Separable costs:-are all costs incurred beyond the split off point that are assignable to one or more individual products.

Final product- a final product is one that is ready for sale without further processing.

Intermediate products- are products that usually require further processing before they are salable to the ultimate consumer, either by the producer or by another processor.

The out put of joint production process can be classified into two general categories-those with a positive sales value and those with a zero sale value. A product is any output that has a positive net sales value (or an output that enables an organization to avoid incurring costs). A joint product has relatively high sales value compared to other products yielded by a joint production process. No journal entries are made in the accounting system to record the processing of such products with zero sales value.

In practice companies distinguish between main products and by-products before allocating joint costs because, by convention, joint costs are allocated only to main products. To take a very simple example, consider a slaughterhouse (Abattoir Enterprise) and assume slaughtering of an ox. The products are meat, skin and wastage. Meat and skin have the sales value and wastages have zero sales value.

Main product-when a joint production process yields only one product with a relatively high sales value, that product is termed a **main product**. Thus, main product is a joint output that generates a significant portion of the net realizable value from the process.

Byproducts- are products that have relatively low sales value compared with the sales value of joint or main products. These are outputs from a joint production process that are minor in quantity and/or net realizable value when compared to the main products. Some outputs of the joint production process have zero sales value. Example, the processing of mineral ore to obtain gold and silver also yields dirt that is recycled back into the ground. No journal entries are usually made in the accounting system to record the processing of such outputs with zero sales value.

7.1. Objectives of allocating Joint Costs

So many reasons can be cited as to why the joint costs to the joint products, but we can have the following core and important that needs allocating of joint costs to joint products.

1) To determine selling price.
2) Inventory costing and computation of cost of goods sold for finical accounting purpose and reports for income tax authorities.
3) Inventory costing and cost of goods sold computations for internal reporting purpose.
4) Performance measurement used in division profitability analysis when compensation is determined for division managers.
5) Cost reimbursement under contracts when only a portion of a business's products or services is sold or delivered to a single customer (such as a government of agency.)
6) Estimating casualty loss for insurance settlements computations when damage claims made by business with joint products, main products, or byproducts are based on cost information
7) For other planning, controlling and decision making activities.

Activity:
Question 1: Assume the sugar industry. The Metehara Sugar factory processes the sugar mill in to several components. Identify the products, the main product (s) and the byproduct (s).

✓ **Characteristics of joint product**

Dear student, from our above discussions we can summarize the following characteristics.

- Joint products are produced from the same raw material
- They are produced simultaneously a common process
- They are comparatively of equal importance
- They may require further processing after their point of separation

Timeout! We have discussed some theoretical aspects in the joint process and incurrence of joint cost so that it is time for you to test your understanding by doing the following exercise.

Activity:
Question 2

1. Define joint process, joint cost, main product and byproduct
2. list the characteristics of joint products
3. Explain why joint cost allocation is required

7.2. Joint Cost allocations Approaches

Several methods can be used in allocating joint cost in to joint products. These methods are basically grouped into two major approaches. These are:

Approach-1: It is an approach that allocates joint costs using market-based data such as revenues. Dear learner, under this method, there are three methods that might be used under this approach that help us for allocation of the joint costs. They are:

- Sales value at the split-off point method
- Estimated net realizable value (NRV) method
- Constant gross-margin percentage NRV method

Approach-2: the second approach allocates joint costs using physical-measure –based data such as weight or volume, etc.

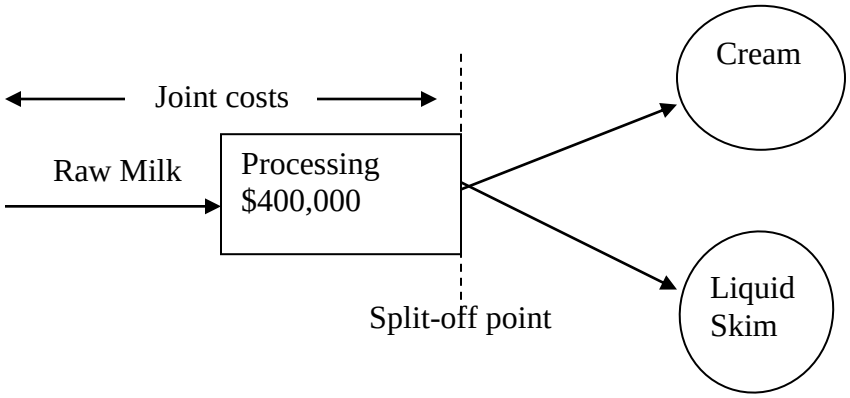
In allocation of joint costs by methods under approach-1, the benefit-received criterion we have discussed in unit three of module I is generally preferred. Revenue, in general, is a better indicator of benefits received than are physical measures such as weight or volume.

I. Sales Value at Split-off point method

Manufacturer with joint production process sometimes must decide whether a joint product should be sold at the split-off point or processed further before being sold. Such decision is, however, not affected by the joint costs to be allocated among the joint products. The only relevant costs are those costs that differ between the two alternatives i.e. processing further or selling the both products or one of the products at the split-off point.

In most cases of simplest joint production process, the joint products are sold at the split-off - point without further processing. In such cases, the relative sales value at the split-off point method is used to allocate the joint costs incurred on the joint products. That is the joint costs are allocated to the joint products on the basis of the proportion of their relative sales value at the split-off point. This method ignores the separable or further processing cost of the joint products with the essence that the products are sealable at the split off point without further processing.

Example: For illustration of the sales value at the split-off point method assume Farmers' Dairy of Dessie purchases raw milk from individual farms and processes it until the split of point, where two products (cream and liquid skin) emerge. These two products are sold to an independent company, which markets and distributes them to supermarkets in Dessie and other retail outlets. The following diagram indicates the basic relationships in this example.



The Summary data presented by the Farmers' Dairy for May 2001 are as follows:

- Row milk processed, 110,000 gallons, 10,000 gallons of raw milk are lost in the production process due to evaporation, spillage and so on, yielding 100,000 gallons of good product.

	Production	Sales
Cream	25,000 gallons	20,000 gallons at $ 8/gallon
Liquid skin	75,000 gallons	30,000 gallons at $4/gallon

	Beginning Inventory	ending inventory
Row milk	0 gallons	0 gallons
Cream	0 gallons	5,000 gallons
Liquid skin	0 gallons	45,000 gallons

Cost of purchasing 110,000 gallons of raw milk and processing it until the split off point to yield 25,000 gallons of cream and 75,000 gallons of liquid skin is $ 400,000.

Dear learner, much attention should be given to the physical amounts used for allocation of joint costs at the sales value at the split of point method. The total production volume is used for the allocation process not the number of units sold. The number of units sold and remained is used to find out the actual revenue reported in the income statement, cost

of goods sold and cost of ending inventory reported in the balance sheet. Keep in touch very carefully with the example below.

Required:

1) Allocate the joint costs to each product using the Sales value at the split off point method
2) How much of the joint costs should be allocated to the cost of goods sold to the ending inventory of each product.

Solution:

Reminder! As we have discussed already sales value at the split-off point method allocates joint costs to joint products on the basis of the relative sales value at the split off point of the total production of these products during the accounting period.

	Cream	Liquid skin	Total
Sales value at split off point (Cream 25,000x$8; LS, 75,000x$4)	$ 200,000	$ 300, 000	$ 500,000
Ratio (200,000; 300,000) 500,000 5000,000	0.40	0.60	
Joint cost allocated (400,000x0.4; 400,000x0.6)	$ 160,000	$ 240,000	$ 400,000
Joint product costs per gallon (160,000; 240,000) 25,000 75,000	$ 6.40	$ 3.20	

Cost of goods sold: cream = 20,000x6.40= $ 128,000

Liquid skin = 30.000 x 3.20= $96,000

Cost of ending inventory: cream =5,000 x 6.4 = $32,000

Liquid skim= 45,000 x 3.2=$144,000

Farmers' Dairy Product-Line Income statement for May 2001 under sales value at split off point joint cost allocation method

	Creams	Liquid skim	Total
-Revenue (cream, 20,000 gallons ×$8; Liquid skim, 30,000 gallons× $4)	$160,000	$120,000	$280,000
Cost of goods sold	128,000	96,000	224,000
- Gross margin (revenue-cost of goods sold)	$32,000	$24,000	$56,000
- Gross margin percentage on revenue	20%	20%	20%

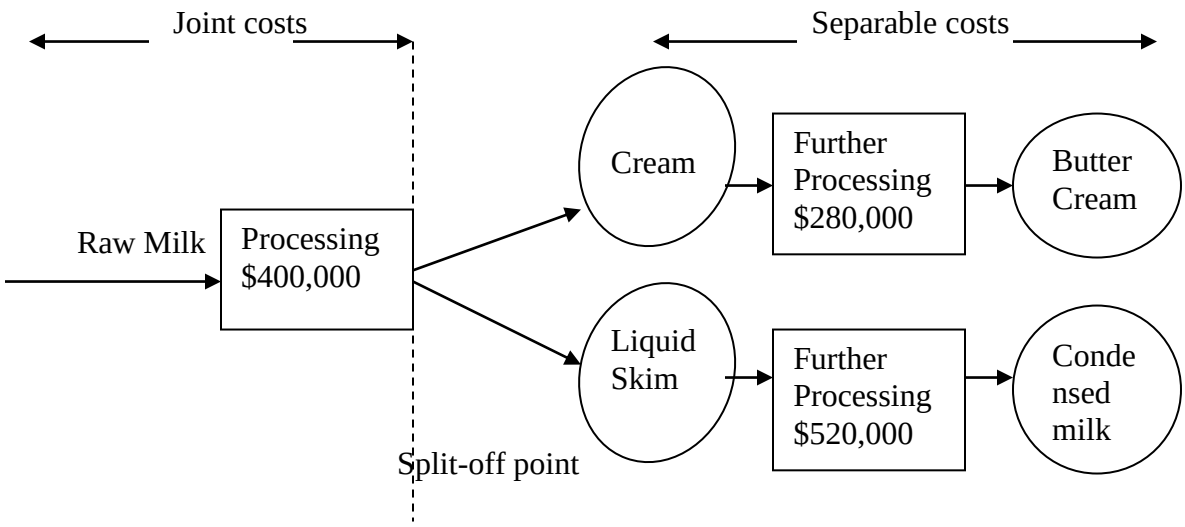
II. Estimated net realizable value (NRV) Method

In many cases, products are processed further beyond split off point in order to bring them to a marketable form or to increase their value above their selling price at the split-off point.

The estimated net realizable value (NRV) method allocates joint costs to joint products on the basis of the relative magnitude of estimated NRV of final products. The net realizable value is expected final sales value in the ordinary course of business minus the expected separable cost of the total production of these products during the accounting period.

The estimated NRV method is preferable to sales value at split-off point method in allocating joint costs when market selling prices for one or more products at the split-off point are not available.

Dear student, for our illustration of this method still consider the Farmers' Dairy product line case and assume the same situation as in the above cases except that both cream and liquid skim can be processed further as it is represented in the diagram supported by narration below:



- Cream ⟶ Butter cream: 25,000gallons of cream are further processed to yield 20,000 gallons of butter cream at additional processing cost (separable cost) of $280,000. Butter cream is sold for $25/gallon.
- Liquid skin ⟶ Condensed milk: 75,000 gallons of liquid skin are further processed to yield 50,000 gallons of condensed milk at additional processing costs of $520,000. Condensed milk is sold for $22/gallon.

	Beginning Inventory	Ending inventory
Raw milk	0 gallons	0 gallons
Cream	0 gallons	0 gallons
Liquid skim	0 gallons	0 gallons
Butter cream	0 gallons	8,000 gallons
Condensed milk	0 gallons	5,000 gallons

Sales during the accounting period were 12,000 gallons of Butter cream and 45,000 gallons of Condensed milk.

	Butter cream	Condensed Milk	Total
Expected final sales value of production (20,000x$25; 50,000x$22)	$500,000	$1,100,000	$1,600,000
Deduct separable costs to complete & sell	280,000	520,000	800,000
Estimated net realizable value at	$220,000	$580,000	$ 800,000

Split off point

Ratio (220,000; 580,000)
800,000 800,000 0.275 0.725

Joint costs allocated: (4000, 000 X 0.275) =$110,000 (400,000x0.725) =$290,000

Production cost per gallon
(280,000+110,000; 520,000+290,000) = $19.5 $16.20
20,000 50,000

Cost of goods sold: Butter cream=12,000x$19.5 = 234,000

Condensed milk 45,000 x $16.20 = $729,000

Cost of ending inventory Butter cream = 8000x$19.5= $156.000

Condensed milk = 5,000X$16.2 = $81,000

Dear learner, herein cost of production refers to the total cost incurred until the product is finalized. That is, the joint cost plus the separable (additional) costs incurred to further process the out puts. Therefore, to determine the cost of each product, it is the total product divided by the number of products produced final as we did in the above example.

Furthermore, to calculate the cost of ending inventory, it is simply the total production cost minus the cost of goods sold. For example: Butter cream the total production cost is $390,000 (280,000 + 110,000) and the cost of goods sold is $234,000, then cost of ending inventory is $156,000 (390,000 – 234,000).

Farmers' Dairy Product-Line Income statement for May 2001 under estimated net realizable value method of joint cost allocation

	Butter Cream	Condensed milk	Total
-Revenue (butter cream, 20,000 gallons ×$25; Condensed milk, 45,000 gallons× $22)	$300,000	$990,000	$1,290,000
Cost of goods sold:			
-Joint costs allocated (butter cream, 0.275× $400,000; condensed milk, 0.725×$400,000)	$110,000	$290,000	$ 400,000

-Separable processing costs ---------- 280,000 ------ 520,000 ----- 800,000

- Cost of goods available for sale ----------390,000 ------- 810,000 ----- 1,200,000

- Deduct ending inventory (butter cream,
8,000 gallons × $19.50; condensed milk,
5,000 gallons ×$16.20) ---------- 156,000 ------- 81,000 ---- 237,000

-Cost of goods sold ---------- 234,000 -------- 729,000 ---- 963,000

- Gross margin (revenue-cost of goods sold) ---$66,000 --------$261,000----$327,000

- Gross margin percentage on revenue ---------- 22.0% ------- 26.4% ----- 25.3%

III. Constant Gross-Margin percentage NRV Method:

Another method of allocating the joint costs to the joint products is the Constant Gross-Margin percentage NRV Method. It allocates joint costs to joint products in such a way that the overall gross margin percentage is identical for the individual products.

This method entails three steps:

Step :- 1. Compute the over all gross margin percentage

2. Use the over all gross margin percentage and deduct the gross margin from the final sales value to obtain the total costs that each product will bear.

3. Deduct the expected separable costs from the total costs to obtain the joint -cost allocation.

To determine the joint-cost allocation, the expected final sales value of the total production during the accounting period ($1,600,000), not the total sales of the period, is used. The joint costs allocated under this method need not always be positive under this method. Some products may receive negative allocation of joint costs to bring their gross-margin percentage up to the overall company average. In our case, the overall gross margin percentage is 25%.

The assumption underlying the constant gross-margin percentage NRV method is that all the products have the same ratio of cost to sales value. This method is fundamentally different from the sales value at split-off point and the estimated NRV methods in that it allocate both joint costs and profit unlike the two market based methods which allocates

only the joint costs to the products. This is because, the total difference between the sales value of production of all products and the separable cost of all products includes both (a) the joint costs, and (b) the total gross margin. Both (a) and (b) are allocated to products under the constant gross-margin method so that each products has the same gross margin percentage

Step1:- Expected final sales value of total production

During the accounting period (20,000 x $25 + 50,000 x $22) = $ 1,600,000

Deduct joint plus reparable costs (400,000+280,000+520,000) =$ 1,200,000

Gross-margin $ 400,000

Gross-margin percentage= Gross margin = $400,000 = 25%
Revenue 1,600,000

Step 2:-

	Butter cream	Condensed milk	Total
Expected final sales value			
(20,000 x $25; 50,000 x$22)	$500,000	$1,100,000	$1,600,000
Deduct gross margin (25) of each)	125,000	275,000	400,000
Cost of goods sold	375,000	825,000	1,200,000
Deduct separable costs	280,000	520,000	800,000
Joint cost allocated	$95,000	$305,000	$400,000

Farmers' Dairy Product-Line Income statement for May 2001 under constant gross margin percentage NRV method of joint cost allocation

	Butter Cream	Condensed milk	Total
-Revenues (butter cream, 12,000 gallons ×$25; Condensed milk, 45,000 gallons × $22) -------	$300,000	$990,000	$1,290,000
- Cost of goods sold:			
• Joint costs (from exhibit 5-9)----------	95,000	82,500	232,500
• Separable costs to complete and sell---	280,000	520,000	800,000
• Cost of goods available for sale ------	375,000	825,000	1,200,000
• Deduct ending inventory (butter cream, 8,000 gallons × $18.75; Condensed milk,			

5000 gallons × $16.50) ----------150,000 ------- 82,500 ----- 232,500

- Cost of goods sold ---------- 225,000 ------742,500 ----- 967,500
- Gross margin(revenue-CGS)-------- $75,000----- $247,500------- $322,500

Gross margin percentage---------- 25% ------- 25% ------ 25%

Approach II: Physical Measures Method:

We have already discussed the methods allocating joint costs to joint products fall under the market based data such as revenue. As per the above classification the second approach for allocating joint costs is physical measures based method. This method allocates joint costs to joint products on the basis of the relative weight, volume, or other physical measures at the split off point.

Dear Learner, consider the data and information given in example under the sales value at the split-off point. As indicated there, the $400,000 joint costs produced 25,000 gallons of cream and 75,000 gallons of liquid skim. Thus, by using the number of gallons produced as the physical measure, joint costs are allocated as presented in the following tabular form.

	Cream	Liquid skin	Total
Physical measures of Production (gallons)	25,000	75,000	100,000
Ratio (25,000; 75,000)	0.25	0.75	
Joint costs allocated	$ 100,000	$300,000	$400,000
Production cost per gallon	$4	$4	

Cost of goods sold: Cream 20,000x4 = $80,000

Liquid 30000x4 = $120,000

Ending inventory: Cream 500x4 = $20,000

Liquid skin 45,000x4 =$180,000

Farmer' Dairy Product-Line Income statement for May 2001 under physical measure method of joint cost allocation method

	Creams	Liquid skim	Total
-Revenue (cream, 20,000 gallons ×$8; Liquid skim, 30,000 gallons× $4)	$160,000	$120,000	$280,000
- Joint costs			
➢ Production costs (cream, 0.25×$400,000; Liquid skim, 0.75×$400,000)	100,000	300,000	400,000
➢ Deduct ending inventory (cream, 5,000 gallons×$4; Liquid skim, 45,000 gallons ×$4)	20,000	180,000	200,000
➢ Cost of goods sold	80,000	120,000	200,000
- Gross margin (revenue-cost of goods sold)	$80,000	$ 0	$80,000

Dear student, please note the following summarized concept about the methods of joint cost allocation. As to which joint cost allocation method is to be used depends on the circumstance at hand. Moreover, each one method has its own advantages and inherent limitations. On the other hand it is worthy to know that joint costs are irrelevant in deciding whether to sale joint products at the split-off point or process them further. This is because joint costs incurred up to the split-off point are past (sunk) costs. Accordingly, none of the methods for allocating joint-product costs discussed earlier in this unit should guide management decisions on selling a product at the split-off point or processing it further. Thus, such decisions should be made on the basis of incremental cost and incremental revenue analysis (i.e. the comparison of additional separable costs incurred in processing the product further and the expected additional operating income beyond the split-off point).

Activity:
Question 3

Assume that the Addis Mojo Edible Oil Factory produces two joint products, GX oil and GZ oil from a single raw material refining process. In the year 1999 E.C the joint process costing of refining the raw material is Br 18,000,000. At split-off point the two products have a market value of Br 20 for GX oil and Br 12 for GZ oil. Separable process costs beyond the split-off point were GX oil, Br 22,500,000, and GZ oil, Br 5,625,000. The unit selling price of the products after further processing is, GX oil is Br 37.5 and GZ oil is Br 18.75. During the fiscal period the Addis Mojo Edible Oil Company produced and sold 750,000 liters of GX oils and 375,000 liters of GZ oil.

Using the above example for the factory, answer the following to questions and after you complete compare your answer with your friend.

1. Based on the estimated net realizable value method, the total costs allocated to GX oil and GZ oil will be:
2. Under the physical-measure method, the joint costs allocated to the two products will be equals to:

Timeout! We have seen the different methods of allocating joint costs to joint products supported by illustrations. Now, attempt the following exercise and check your understanding of the methods.

Exercise

Lucy Chocolate Company manufactures and distributes chocolate products. It purchases cocoa beans and processes them into two intermediate products: *Chocolate-powder liquor base and Milk-chocolate liquor base.*

These two intermediate products become separately identifiable at a single split off point. Every 500 pounds of cocoa beans yield 20 gallons of chocolate-powder liquor base and 30 gallons of milk-chocolate liquor base.

The chocolate-powder liquor base is further processed into chocolate powder. Every 20 gallons of chocolate –powder liquor base yield 200 pounds of chocolate powder. The

milk-chocolate liquor base is further processed into milk chocolate. Every 30 gallons of milk-chocolate liquor base yields 340 pounds of milk chocolate.

An overview of the manufacturing operations at Lucy Chocolates is as follows:

Production and sales data for August 2006 are:

Cocoa beans processed, 5,000 pounds
Costs of processing cocoa beans to split off point (including purchase of Beans) = $10,000

	Production	Sales	Selling Price
Chocolate powder	2,000 pounds	2,000 pounds	$4 per pound
Milk chocolate	3,400 pounds	3,400 pounds	$5 per pound

The August 2006 separable costs of processing chocolate-powder liquor base into chocolate powder are $ 4,250. The August 2006 separable costs of processing milk-chocolate liquor base into milk chocolate are $8,750.

Lucy fully processes both of its intermediate products into chocolate powder and milk chocolate. There is an active market for these intermediate products.

In August 2006, Lucy could have sold the chocolate-powder liquor base for $21 a gallon and the milk-chocolate liquor base for $26 a gallon.

Required:

Allocate the joint costs of $10,000 to the products under the following methods:

A. Sales value at split off point method.
B. Estimated net realizable Value method, and
C. Constant gross-margin percentage NRV method.

Have you completed doing the exercise? How do you see it? If you do it self-assuredly, congratulations! If not go back to the discussion and read it very carefully.

7.3. Accounting for Byproducts, Scrap and Waste

Dear learners, joint production process may yield not only joint and main products but byproducts as well. By-products are unavoidable but unneeded products of the production process. Although byproducts have much lower sales value than do joint or main

products, the presence of by-products can affect the allocation of joint costs. Since these products are relatively minor products, alternative method to account for them are not likely to have a material effect on the financial statements for either internal or external reporting. Hence, some companies recognize by-products in the financial statements at the time production is completed (production method) while other companies make by-products accounting as easy as possible by simply expensing the by-products' costs in the period they are incurred and then recording the total revenue from by-products when they are sold (the sale method) specially when dollar amounts of by-products are immaterial.

- **Distinction of by-products from joint products and main products**

There are no hard rules to easily differentiate by-products from joint products and main products. A product may be treated as a joint product in one business and the same product may be treated as a byproduct in another business. However, there are certain factors that enable us distinguish the products from each other. Among the many factors, the following are the commonly used to distinguish by-products from joint and main products.

A). Relative sales value: if there are two products produced from the same production process, the one with relatively high sales value is the main product and the other with low sales value is the by-product. However, if the products have relatively the same or relatively equal sales value, the products are joint products.

B). Organizational objective: if a particular organization is established to produce W, the unwanted part of the production process product V is the by-product. For example, Metehara Sugar factory is established to produce sugar, the unavoidable part of the production process bagasses and molasses are by-products.

C). Management Policy: treatment of similar products differs from organization to organization depending on their policy. Some organizations treat the same product as by-product or joint product which is considered by another organization reversely. In general, a product may be treated as a joint product in one business and the same product may be treated as a byproduct in another

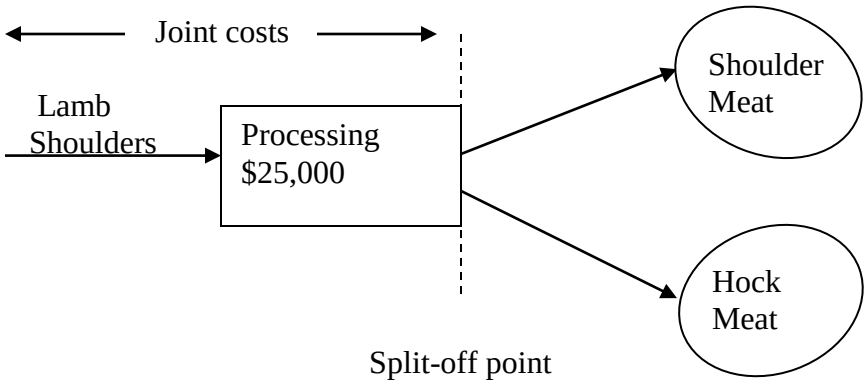
Dear learner let's support our descriptions of the by-products using illustrative examples. Assume that **Meat works Groups** processes meat from slaughterhouses. One of its departments cuts lamb shoulders and generates two products:

Shoulder meat (the main product):- sold for $60 per pack

Hock meat (the byproduct):- sold for $4 per pack

Both products are sold at the split-off point without further processing, as shown in the following exhibit.

Overview of Meat works Groups



- ✓ Additional information

	Productions	Sales	Beginning Inventory	Ending Inventory
Shoulder meat	500	400	0	100
Hock meat	100	30	0	70

The joint manufacturing costs of these products in July 2001 were $25,000 (comprising $15,000 for direct materials and $10,000 for conversion costs.)

As we have already stated in our introductory pat of this unit, there are two basic methods used to accounting the by products. These are:

- Method A: Byproducts recognized at time production is completed
- Method B: Byproducts recognized at time of sales

Method-A: Byproduct recognized at time production is completed- this method recognizes the byproducts in the financial statements as the production process is completed and no revenue is recognized from the sales of the byproducts rather the selling price of the byproducts is assumed to be as the reduction of the cost for the main product.

Method-B: Byproduct Recognized at time of sale- This method makes no journal entries until sale of the byproduct are reported as a revenue item in the income statement at the time of sale. It delays the recognition of byproducts until the time of sales. It recognizes sales revenue when the byproducts are sold under this method byproducts share no cost from the cost of the production process.

Activity:
Question 4

Dear learner, assume a simple production process in your surrounding, for example woodwork shop, based on your observation answer the following questions:

1. What is the main product of the woodwork shop?
2. What byproducts do you observe?
3. How do you differentiate the byproduct from the main or joint products?

Income statement of Meat works Group

From the above example we have for Meat Works Group, we can prepare an income statement under the two methods and we can see the difference in treatment of the byproducts.

	Byproduct accounting Methods	
	Method A	Method B
Revenues:		
Main product: Shoulder meat (400 x $60)	$24,000	$24,000
Byproducts: Hock meat (30 x $4)	-	120
Total revenues (a)		$24,000
$24,120		
Cost of goods sold:		
Total manufacturing costs	25,000	25,000
Less: byproduct revenue (100 x $4)	400	-
Net manufacturing costs	$24,600	$25,000
Less: main product ending inventory cost ***	4,920	5,000
Cost of goods sold (b)	$19,680	$20,000
Gross margin (a-b)	$4,320	$4,120

*** Main product cost Method A: $\frac{\$24,600}{500}$ = $49.20 Cost of sold units = 400 x 49.2 = $19, 680.

Method A: The production method: The 100 packs of hock meat- are recognized in the month they are produced (July 2001) and under this method, as we can see from the income statement, their total sales value is treated as the reduction of cost for the main product. The estimated net realizable value from the byproducts produced is offset against the costs of the main (or joint) products. From the above illustrative example we can pass the following journal entries under Method A.

1. Work in process ---------- 15,000

Accounts payable---------- 15,000

To record direct material purchased and used in production during July.

2. Work in Process ----------10,000

Various accounts---------- 10,000

To record conversion costs in the production process during July such as energy, manufacturing supplies, all manufacturing labor, and plant depreciation.

3. Byproduct Inventory-Hock Meat (100×$4) ------ 400

Finished goods-Shoulder Meat

($25,000-$400)----------24,600

Work in process($15,000+$10,000)---------- 25,000

4a. Cost of goods Sold [(400÷500) ×$24,600]---- 19,680

Finished goods-shoulder Meat----------19,680

To record the cost of the main product sold during July.

4b. Cash or Accounts Receivable (400×$60) ---------- 24,000

Revenue-shoulder Meat ----------24,000

To record the sales of the main product during July

5. Cash or Account Receivable (30×$4) ---------- 120

Byproduct Inventory-Hock Meat----------120

To record the sales of the byproduct during July

This method reports the byproduct inventory of hock meat in the balance sheet at their $4 per pack selling price [(100-30) ×$4 = $280]. When the byproduct is sold in subsequent period, the income statement would match the selling price with the net selling price reported for the byproducts inventory.

Method-B: Byproduct Recognized at time of sale- This method makes no journal entries until sale of the byproduct are reported as a revenue item in the income statement at the time of sale. In our example, the byproduct revenue in July 2001 would be $120 (30×$4) because only 30 packs of the hock meat are sold in July (of the 100 packs produced.). The journal entries would be:

Journal entries **1 and 2 remains** the same as for method-A

3. Finished goods-Shoulder Meat ----------25,000

Work in process----------25,000

To record goods completed during July.

4a. Cost of goods sold [(400÷500) ×$25,000] ---------20,000

Finished goods-Shoulder Meat----------20,000

To record the cost of the main product sold during July.

4b. Same as for method -A

5. Cash or Accounts Receivable----------120

Revenue-Hock Meat----------120

To record the sales of the byproduct during July

Activity:
Question 5

Assume one tone of raw material put in to a common process yields four products, A, B, C, and D, their weight being 63kg, 117kg, 180kg, and 540kg, respectively. The balance in weight is considered as normal loss. Based on the total processing cost of birr 20,000 per tone of raw material input, the proportionate cost to products A, B, C and D, respectively are (amounts in birr)? First, do by yourself and then compare your answer with your mate.

Exercise

A single production process yields two products: **product 'x'** (**main product**) & **product y** (**by-product**). Both products are fully processed at split- off point, and there are no separable costs.

The total manufacturing cost is Br. 80,000.

	Production (in kgs)	Sales (in kgs)	Selling Price per kg
Product 'A'	10,000	6,000	Br. 20.00
Product 'B'	2,000	1,200	Br. 2.00

Required: - Prepare the income statement under the two methods and pass the necessary journal entries

7.4. Chapter Summary

A single production process may yield several joint products or main product and byproducts. A joint cost is the cost of a single process that yields these multiple products. The split off point is the juncture in the process when the products become separately identifiable.

Joint products have relatively high sales value and are not separately identifiable as individual products until the split off point. A by product has a low sales value compared with the sales value of a joint product or main product.

The purpose of allocating joints costs to products include inventory costing for external financial reporting, internal financial reporting, cost reimbursement under contracts, insurance settlement, rate regulation, etc.

Two approaches, the market based method (sales value at the split-off point, estimated net realizable value and constant gross profit percentage) and physical measures methods are used to allocate the joint costs to the joint products. The sales value at the split-off point method and the physical measures method allocates joint costs at the split-off point that the products are sealable at the split-off point.

Congratulations! This is the end of the unit. We hope that you have grasped adequate knowledge of this unit. If your answer is yes, congratulations again, but if you don't agree with our saying go back and read again till you confidently say I am equipped with sufficient understanding of this unit. To evaluate your progress attempt the self-test given below and compare your answers with the answers given at the end.

7.5. Self-Test Questions

I. Multiple Choice: Choose the best answer

1. A joint process is:
   A. A diversified process that converts a common input in to several outputs.
   B. A single process that converts a common input in to only a main product and by products.
   C. A single process that converges and converts diversified inputs in to very similar products.
   D. None

2. _____ are those manufacturing cost incurred during the processing of original input before the products are separated

a) Joint costs b) direct product costs c) further processing costs d) separable cost

3. One of the following is odd in relation to assigning joint costs to products based on the ability to generate revenue.
   A. Sales value at a split off point.
   B. Physical volume method.
   C. Constant gross margin percentage NRV.
   D. Estimated net realizable value.
   E. None

4. Byproducts are:
   A. items significant part of the production process
   B. items with low sales value and are of secondary value of the production process
   C. Possibly avoidable part of the production process

D. Items having proximate sales value to the joint products.

E. None

5. A method that delays the recognition of the byproducts until sales is:
   A. Sales method (method B)
   B. Estimated net realizable value
   C. Constant gross profit percentage NRV method
   D. Production method (method A)

II. Fill in the blank

Fill the best answer you opt**.**

1. The stage of production at which separate products are identified is known as ___.
2. The _____ product usually has a greater sales value than byproducts
3. The _____ of the product is the most important criterion (factor) for distinguishing between byproducts, main products and joint products.
4. The cost incurred beyond the split-off point of the production process of the joint products is _____.
5. Under the _____ method of apportionment of the joint costs, the cost per unit of each product is the same.

III. Workout Questions

Rainbow Lumber has products for sale to lumber wholesalers. Its most known line is oak products. Oak tree growers sell rainbow lumber whole trees. These trees are jointly processed up to the split off point at which raw select oak, raw white oak and raw knotty oak become separable products. Each raw production is then separately further processed by Rainbow Lumber into finished products (select oak, white oak and knotty oak) that are sold to lumber wholesalers. Data for August 2005 are:

i) Joint processing cost (including cost of oak trees) $300,000

ii) Separable product at split off point
   a) Raw select oak 30,000 board feet
   b) Raw white oak 50,000 board feet
   c) Raw knotty oak 20,000 board feet

iii) Final product produced and sold
   a) select oak 25,000 board feet at $16 per board feet

b) White oak 40,000 board feet at $9 per board feet

c) Knotty oak 15,000 board feet at $ $7 per board feet

iv) Separable processing costs

a) For select oak $60,000

b) For white oak $90,000

c) For knotty oak $15,000

There is an active market for raw oak products. Selling prices available in august 2005 were raw select oak ($8 per board feet), raw white oak ($4 per board feet) and raw knotty oak ($3 per board feet). There were no beginning and ending inventories for August 2005.

Required: Allocate the joint cost to the three products using:

a) Sales at a split off point method

b) Physical measures method and

c) Estimated net realizable value (NRV) method.

REFERENCES

- Horngren, Foster, & Datar. Cost Accounting: A Managerial Emphasis. 9th Ed. 1997/Horngren, Sunden & Stratton. Introduction to Management Accounting. 11th Ed. 1999
- C.T Horgren, Introduction to Management Accounting 4th to 8 th editions, 1999 USA
- C.T. Homgren, Cost Accounting: A Managerial Emphasis 5th to 8th editions prentice Hall Inc. 1982 to 1994
- Homgren, foster, &Datar, Cost Accounting A Managerial Emphasis. 10 th Edition
- L.E. Heitger Managerial Accounting 1th and 2 nd editions, McGraw Hill , 1998, India
- Getu Jemaneh, Management Accounting 1996.
- Ray H.Garrison, Managerial Accounting. 6th edition
- Caluinengler, Managerial Accounting 2nd edition
- L. Gayle Rayburn Principles of cost Accounting using a cost Management Approach 4th edition Richard DIR WIN Inc. 1989.
- Robert X. Kaplan Advanced Management Accounting 1st and 2nd edition prentice Hall, Inc, 1982 and 1989 (Chapters 2, 11,12, and 13 only)

APPENDIX I: ANSWER KEY FOR SELF TEST QUESTIONS

Answer key for Self test Questions :Chapter One

True or false items

1. **False 2. True**

Multiple choices items

3. C 4. D 5.E

Fill in the blanks:

6. Financial accounting 7.Cost benefit approach 8.Competence

Answer key for Self test Questions: Chapter Two

Multiple choices

1. **D, 2. D, 3.C, 4.A, 5.D, 6.C, 7.E, 8.A, 9.C, 10.D**

Answer key for Self test Questions: Chapter Three

Multiple choices

1.A 2.D 3.D. 4.E 5.D 6.C 7.D 8.B 9.D 10.D 11.C 12.C 13.D. 14.D

Answer key for Self test Questions: Chapter Five

i. Yes, marginal costing is used for internal purpose. Variable (marginal) costing, which only includes variable costs in inventory valuation, does not coincide with generally accepted accounting principles. Because a portion of product costs (fixed cost) are not included in inventory cost determination. It is used for internal reporting purpose to compare the pats operational performance (profit, loss and costs).

2. Marginal costing uses only the variable costs for inventory valuation. The fixed costs are written off against contribution margins of a particular period. Where as the total costing uses the fixed costs and variable costs for inventory valuation. This fixed overhead makes difference between the net income calculated under the two methods. This is due to that in absorption costing some of the fixed costs

are become part of the closing stock and transfer to the future. If closing stock is more than opening stock, net income in absorption costing is more than net income in variable (marginal) costing.

3. The following are the important points that should be taken in to consideration when we are comparing the income statement under absorption costing and variable costing.

   - ✓ When sales and production coincide i.e., there is neither opening stock nor closing stock, the results under both the methods will be same.
   - ✓ When closing stock is more than the opening stock, profit under absorption costing will be more than the profit under variable costing. This is because, under absorption costing, a portion of fixed overhead is charged to the closing stock and carried over to the next instead of being charged to the current period. When closing stock is less than the opening stock, the profit shown under absorption costing will be lower than the profit shown under variable costing.

Answer key for Self test Questions: Chapter Seven

I. **Multiple choice**

1. D 2. A 3. B 4. B 5. A

II. **Fill in the blank**

1. Split-off point
2. Main product
3. Relative sales value
4. Separable (further processing) cost
5. Physical measures method

III. **Workout question**

A). Sales value at the split-off point method

Product	Quantity	price	Total sold	Joint cost allocated to each product
Raw select oak	30,000 b.f.	$8 per b.f.	$240,000	=$144,000
Raw white oak	50,000 b.f.	4 per b.f.	200,000	=120,000
Raw knotty oak	20,000 b.f.	3 per b.f.	60,000	= 36,000

Total $500,000

Raw selected oak = $240,000 / 500,000 x 300,000 = $144,000

Raw white oak = $200,000 / 500,000 x 300,000 = $120,000

Raw knotty oak = $60,000 / 500,000 x300,000 = $36,000

B). Physical measures method

Product	Quantity	Joint cost allocated
Raw select oak	30,000 b.f.	30,000 / 100,0000 x 300,000 = $ 90,000
Raw white oak	50,000 b.f.	50,000 / 100,000 x 300,000 = $150,000
Raw knotty oak	20,000 b.f.	20,000 x 300,000 = $60,000
Total	100,000	100,000

C). Estimated net realizable value method

	Selected oak	white oak	knotty oak
Final sales value 25,000x$16; 40,000x9; 15,000x7)	$400,000	$360,000	$105,000
Deduct separable costs	60,000	90,000	15,000
Estimated net realizable value at the split-off point	$340,000	$270,000	$90,000
Joint cost allocated: (340,000 / 700,000 x 300,000; 270,000 / 700,000 x300,000; 90,000 / 700,000 x300,000)	=$145,714	=$115,714	= $38,572

APPENDIX II: INDIVIDUAL ASSIGNMENT

WOLLO UNIVERSITY
CBE/DEPARTMENT OF ACCOUNTING AND FINANCE
COST AND MANAGEMENT I

INDIVIDUAL ASSIGNMENT

FOR DISTANCE PROGRAM ACCOUNTING AND FINANCE STUDENT

Course Number: ACFN2091 ***Total Mark:35%***

Name _____ **ID No** _____

Department _____ **Section** _____ **Sign** _____

PART-ONE: Write 'True' If the Statement Is Correct and 'False' If the Statement Is Incorrect (**0.5point each**)

1. Under variable costing, an increase in the fixed factory overhead will have no effect on the unit product cost.
2. There is no difference in the unit costs computed under the weighted-average and FIFO methods of process costing if there is no beginning work in process inventories.
3. Revenues of the byproducts are reported as a revenue item in the income statement when byproducts recognized at the time of sale is made.
4. Process costing system is used in a situation where companies produce a single product or single mix of products continuously for an extended period of time.
5. Fixed costs are decreases per unit as the activity level falls and increases when the activity level rises.
6. All indirect costs are directly traced to the cost object.
7. Cost allocation is used to describe the assignment of direct costs to a particular cost object.
8. Both actual and normal costing allocates indirect costs based on the budgeted indirect cost rates.
9. If the amount of manufacturing overhead applied is less than the actual amount, the difference is said to be over applied overhead.
10. Financial accounting provides financial and non financial information to internal users.

PART-TWO: Choose the correct answer from the given alternatives **(1point each)**

1. Which of the following statement is correct about Job order costing system?

   F. Homogeneous products are produced continuously
   G. Cost is accumulated by process or department for a specified period of time

H. Production cycle is usually takes short period of time
I. None of the above.

2. Assume that ABC manufacturing company estimated and actual manufacturing over head costs Are $400,000and $380,000 respectively, estimated and actual total amount allocation base are 80,000 and 72,000 machine hours respectively. Based on the above information what is the under/ over applied over head cost?

A. $44,444 over applied overhead
B. $20,000 under applied overhead
C. $20,000 over applied overhead
D. None

3. Which one the following would the job order system be appropriate?

F. Flour companies
G. printing firms
H. Repair shops
D. Petroleum refineries
E. B and C
F.A and D

4. Which of the following cost is necessary production and will not be incurred if there is no production?

A. Direct cost
B. Factory over head cost
C. product cost
D. All

5. The secondary product recovered in the course of manufacturing a primary product during a joint process is:

A. a split-off product
B. a byproduct
C. a main product
D. a joint-product
E. None

6. The FIFO method provides a major advantage over the weighted-average method in that:

A. the FIFO method provides measurements of work done during the current period
B. the calculation of equivalent units is less complex under the FIFO method
C. the FIFO method treats units in the beginning inventory as if they were started and completed during the current period
D. the weighted-average method ignores units in the beginning and ending work in rocess inventories
E. None

7. XYZ Company uses the weighted-average method in its process costing system. The Painting Department started the month with 6,700 units in its beginning work in process inventory that were50% complete with respect to conversion costs. An additional 57,800 units were transferred in from the prior department during the month to begin processing in the Painting Department. There were 7,600 units in the ending work in process inventory of the Painting Department that were 60% complete with respect to conversion costs. What were the equivalent units of production for conversion costs in the Painting Department for the month?

A. 58,700 B. 62,360 C. 61,460 D.56,900

8. A company produces a single product. Variable production costs are $12 per unit and variable selling and administrative expenses are $3 per unit. Fixed manufacturing overhead totals $36,000 and fixed selling and administration expenses total $40,000. Assuming a beginning inventory of zero, production of 4,000 units and sales of 3,600 units, the dollar value of the ending inventory under variable costing would be:

A. $8,400 B. $4,800 C.$6,000 D.$3,600 E. None

9. Indirect labor is a part of:

A. Conversion cost C. Period cost E. None of the above

B. Prime cost D. Nonmanufacturing cost

10. Fixed costs expressed on a per unit basis:

A. will decrease with increases in activity
B. will increase with increases in activity
C. are not affected by activity.
D. should be ignored in making decisions since they cannot change
E. None of the above

PART THREE: **Work Out Questions (Total 20points)**

1. Robinson manufacturing company uses a job order costing system. Its job order costing system has two direct costs (DM and DL) and one indirect cost category

On January 1, 2004, the following inventories are available

- Raw material ---------- $10,000
- WIP ---------- $5,000
- Finished goods ---------- 15,000

Robinson budgeted the 2004 manufacturing overhead to be $1,280,000 and the budget quantity of machine hours (allocation base) are 16,000 machine hours.

The following transaction occurs during the month of January

a) Purchase of material (direct and indirect), $89,000 on account
b) Raw material sent to manufacturing plant floor is $85,000 out of which $4000 is indirect material
c) Manufacturing labor wages liability incurred is $54,000 out of which $15,000 is indirect
d) The actual machine hours used in the period were 1000 machine hours. The manufacturing over head is allocated using this actual machine hour.
e) Additional manufacturing over head cost incurred during the month is $75,000.this cost consists of utility and repairs, $23, 000, insurance expired $2,000, depreciation expense $50,000.

f) Cost of finished goods of eight individual jobs completed and transferred out is $188,800.
g) Finished goods costing $180,000 was sold for $300,000 on cash.

Required:

i. Journalize the above transactions
ii. Post using T-account
iii. Compute the under or over applied MOH cost
iv. Close the amount using direct write off to cost of goods sold

2. Shark Bicycle of Bombay, produces an inexpensive, yet rugged, bicycle for use on the city's crowded streets that it sells for 500 Birr each. Selected data for the company's operations last year follow:

Units in beginning inventory 0
Units produced. 10,000
Units sold 8,000
Units in ending inventory 2,000
Variable costs per unit:
Direct materials . . . . . Br. 120
Direct labor . . . . . Br. 140
Variable manufacturing overhead . . . . . Br. 50
Variable selling and administrative . . . . . Br. 20
Fixed costs:
Fixed manufacturing overhead . . . . . Br. 600,000
Fixed selling and administrative . . . . . Br. 400,000
Required:

a) Compute the unit product cost by using absorption costing.
b) Compute the unit product cost by using variable costing.
c) Prepare income statement under absorption and variable costing

3. Honey butter, Inc., manufactures a product that goes through two departments prior to completion- the Mixing Department followed by the Packaging Department. The following information is available about work in the first department, the Mixing Department, during June.

	Units	***Percent Completed***	
		Materials	***Conversion***
Work in process, beginning	70,000	70%	40%
Started into production	460,000		
Work in process, ending	450,000	75%	25%
Work in process, beginning		$36,500	$13,500
Cost added during June		$391,850	$287,300

Required:

A. Assume that the company uses the weighted-average method;

i. Determine the equivalent units for June for the Mixing Department.
ii. Compute the costs per equivalent unit for June for the Mixing Department.
iii. Determine the total cost of ending work in process inventory and the total cost of units transferred to the Packaging Department.
iv. Prepare a cost reconciliation report for the Mixing Department for June.

4. Let's say XX produces two joint products—corn syrup and corn starch—using a common production process. In July 2012, XX reported the following production and selling-price information:

	Corn Syrup	Corn Starch	Joint Costs
Joint costs (costs of processing corn to split off point			325, 000
Separable cost of processing beyond split off point	$375, 000	$93,750	
Beginning inventory	0	0	
Production and Sales (cases	12,500	6250	
Ending inventory (case)	0	0	
Selling price per case	$50	25	

Required : Allocate the $325,000 joint costs using the constant gross-margin percentage NRV method?