Principles of Cost Accounting

Collections

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Introduction

The primary purpose of accounting is to provide financial information relating to an economic entity. Thus, accounting is concerned with measuring, recording, and reporting financial information for various groups of users. Financial information is required by management to plan and control the activities of a business as well as by others who provide funds or who have various interests in the operations of the entity. Accounting systems take economic events and transactions, such as sales and materials purchases, and process these data into information helpful to managers, sales representatives, production supervisors, and others. Processing any economic transaction means collecting, categorizing, summarizing, and analyzing. Accounting systems provide the information found in the income statement, the balance sheet, the statement of cash flow, and in performance reports, such as the cost of serving customers or running an advertising campaign. Managers use accounting information to administer the activities, businesses, or functional areas they oversee and to coordinate those activities, businesses, or functions within the framework of the organization. **The accounting system that provides the information to measure product costs and performance and control the operations of a firm is called the cost accounting or managerial accounting system.** For example, costs are collected by category, such as materials, labor, and shipping. These costs are then summarized to determine total costs by month, quarter, or year. The results are analyzed to evaluate, for example, how costs have changed relative to revenues from one period to the next.

Financial accounting versus cost accounting

For this book purpose, the field of accounting may be divided into financial accounting and cost or management accounting. Financial accounting is largely concerned with financial statements for external use by investors, creditors, labor unions, financial analysts, government agencies, and other interested groups. **Cost or management accounting is primarily concerned with the accumulation and analysis of cost information for internal use by managers for planning, control, and decision making.**

Cost accounting versus management accounting

In recent years the formal definition of cost accounting has been revised. **The National Association of Accountants (NAA)' defines Cost Accounting as "a technique or method for determining the cost of a project, process, or thing used by the majority of the legal entities in a society, or specifically prescribed by an authoritative accounting group".** The term "management accounting," as defined by the NAA is used in its broadest sense as the process of:

- Identification. The recognition and evaluation of business transactions and other economic events for appropriate accounting action.
- Measurement. The quantification, including estimates, of business transactions or other economic events that have occurred or may occur.
- Accumulation. The disciplined and consistent approach to recording and classifying appropriate business transactions and other economic events.
- Analysis. The determination of the reasons for, and the relationships of, the reported activity with other economic events and circumstances.
- Preparation and interpretation. The meaningful coordination of accounting and/or planning data to satisfy a need for information presented in a logical format, and. if appropriate, including the conclusions drawn from those data.
- Communication. The reporting of pertinent information to management and others for internal and external uses

Management accounting is used by management to

- Plan. To gain an understanding of expected business transactions and other economic events and their impact on the organization.
- Evaluate. To judge the implications of various past and/or future events.
- Control. To ensure the integrity of financial information concerning an organization's activities or its resources.
- Assure accountability. To implement the system of reporting that is closely aligned to organizational responsibilities and that contributes to the effective measurement of management performance.

The objectives of management accounting are:

1- To provide information needed for planning, evaluating and controlling operations; safeguarding the organization's assets; and communicating with interested outside parties.

2- To participate in making strategic, tactical, and operating decisions and helping to coordinate the effects of the entire organization.

This chapter is devoted what does the word cost mean to you? Is it the price you pay for something of value? A cash outflow? Something that affects profitability? There are many different types of costs, and at different times organizations put more or less emphasis on them. When times are good companies often focus on selling as much as they can, with costs taking a backseat. But when times get tough, the emphasis usually shifts to costs and cutting them.

Cost Concepts, definitions, and classifications

The initial phase in the study of any new area or subject involves familiarization with its unique concepts and terminology. This process of familiarization provides the student with a basic foundation on which to build an understanding of the procedures, issues, and applications that will be encountered in his or her studies.

Cost or management accounting is a distinct field of study and, as such, basic concepts, definitions, and classifications will be presented to provide a conceptual foundation for the subject matter to be covered in the remainder of this book.

There is no better place to begin building our conceptual foundation than with the single most important element, cost, that forms the basis for product costing, performance evaluation, and managerial decision making. Cost is defined as the "value" of the sacrifice made to acquire goods or services. The sacrifices made are measured in dollars by the reduction of assets or incurrence of liabilities at the time the benefits are acquired. At the time of acquisition, the cost incurred is for present or future benefits. When these benefits are utilized, the costs become expenses. An expense is defined as a cost that has given a benefit and is now expired. Unexpired costs that can give future benefits are classified as assets.

Expenses are matched against revenues to determine net income or loss for a period. Revenue is defined as the price of products sold or services rendered. In certain instances, the goods or services purchased become valueless without having provided any benefit. These costs are called losses and appear on the income statement as a deduction from revenues, in the period that the decrease in value occurred. Both expenses and losses have the same impact on net income-both are reductions. However, they are listed separately on an income statement, after income from operations, in order to properly reflect the amounts associated with each.

For example, assume that on January 2 a company purchases two items of inventory at $1,000 each. On January 15, the company sells one of the items for $1,600. The remaining item of inventory is discarded as worthless on January 28 because it is found to be defective. The cost of buying the goods was $2.000 or $1,000 for each item. A $1,000 expense resulted on January 15 when the company sold one item and received revenue of $1,600. A loss of $1,000 resulted on January 28 when the remaining item in inventory was discarded.

Cost accounting information pool

Management is constantly faced with making choices between alternative courses of action. Information about various types of costs and their behavioral patterns is vital to effective decision making. Data can be visualized as being in one large cost accounting information pool which is routinely accessed for purposes of product costing, and performance evaluation and managerial decision making. The cost accounting information pool, to provide optimum information, consists of past revenues and costs necessary for product costing and performance evaluation and projected revenue and costs necessary for managerial decision making.

The cost data in the pool is classified into various categories, according to:

1- Elements of a product (i.e., product cost)
2- Relationship to production
3- Relationship to volume
4- Ability to trace
5- Department where incurred
6- Functional areas (activities performed)
7- Period charged to income
8- Relationship to planning, controlling, and decision making

1- ELEMENTS OF A PRODUCT (THAT IS, PRODUCT COST)

The cost elements of a product, or its integral components, are direct materials, direct labor, and factory overhead. This classification provides management with information necessary for income measurement and product pricing. The elements of a product are defined as follows:

Materials. These are the principal substances used in production that are transformed into finished goods by the addition of direct labor and factory overhead. The cost of materials may be divided into direct and indirect materials as follows:

Direct materials. All materials that can be identified with the production of a finished product; that can be easily traced to the product; and that represent a major material cost of producing that product. An example of direct material is the lumber used to build a bunk bed.

Indirect materials. All materials involved in the production of a product that are not direct materials. Indirect materials are included as part of factory overhead. An example of indirect material is the glue used to build a bunk bed.

Labor. Labor is the physical or mental effort expended in the production of a product. Labor costs may be divided into direct and indirect labor as follows:

Direct labor. All labor directly involved in the production of a finished product; that can be easily traced to the product; and that represents a major labor cost of producing that product. The work of machine operators in a manufacturing company would be considered direct labor.

Indirect labor. All labor involved in the production of a product that is not considered direct labor. Indirect labor is included as part of factory overhead. The work of a plant supervisor is an example of indirect labor.

Factory overhead. This all-inclusive cost pool is used to accumulate indirect materials, indirect labor, and all other indirect manufacturing costs. Such costs are included in factory overhead because they cannot be directly identified with specific products. Examples of other factory overhead costs besides indirect materials and indirect labor are rent, light, and heat for the factory, and depreciation of factory equipment. Factory overhead costs can be further classified as fixed, variable, and mixed (definitions will be presented later in the chapter).

For example, assume a company incurs the following costs in manufacturing wood tables:

Materials:	
Oak lumber	$150,000
Pine lumber	110,000
Glue	800
Screws	1,000
Total	$261.800
Labor:	
Wood cutters	$180,000
Table assemblers	190,000
Sanders	170,000
Supervisor	20,000
Janitor	10,000
Total	$570,000
Other:	
Factory rent	$70,000
Factory utilities	20,000
Office rent	16,000
Office salaries	80,000
Depreciation of factory equipment	21,000
Depreciation of office equipment	8,000
Total	$215,000
Grand total	$1,046,800

Based on the preceding figures, the cost of direct materials would be $260,000; direct labor, $540,000, and factory overhead, $142,800. These three figures represent the elements of the product, as broken down in Table 1-1. Not included as product costs are office rent ($16,000), office salaries ($80,000), and depreciation of office equipment ($8,000). These office costs are not elements of a product. They usually appear as deductions on the income statement from gross profit under the caption of "general and administrative expenses." The $942,800 of total product cost will appear as the major component in a manufacturer's cost of goods manufactured statement (a discussion and an example of which appears in Chapter 2).

The classification of cost based on relationship to the product will change as the relationship changes. For example, lumber is a direct material cost when used in the manufacture of wood furniture. However, lumber is an indirect material cost when used as shipping crates for equipment. Maintenance personnel (janitors, custodians) in a manufacturing plant are an indirect labor cost; their function is not directly related to production. However, in a company which provides maintenance service to others, maintenance personnel would be considered a direct labor cost.

TABLE 1 - Elements of a product

	Direct materials	Direct labor	Factory overhead	Total product cost
Oak lumber	$150,000			$150,000
Pine lumber	110,000			110,000
Glue			$ 800	800
Screws			1,000	1,000
Wood cutters		$180,000		180,000
Table assemblers		190,000		190,000
Sanders		170,000		170,000
Supervisor			20,000	20,000
Janitor			10,000	10.000
Factory rent			70,000	70,000
Factory utilities			20,000	20.000
Depreciation of factory equipment			21,000	21,000
Total	**$260,000**	**$540,000**	**$142,800**	**$942,800**

2- RELATIONSHIP TO PRODUCTION

Costs may be classified according to their relationship to production. This classification is closely related to the cost elements of a product (direct materials, direct labor, and factory overhead) and the major objectives of planning and control.

The two categories, based on their relationship to production, are prime costs and conversion costs.

Prime costs. Prime costs are direct materials and direct labor. Prime costs are directly related to production.

Conversion costs. These are costs concerned with transforming direct materials into finished products. Conversion costs are direct labor and factory overhead.

Prime costs = direct materials + direct labor

Conversion costs = direct labor + factory overhead

Note that direct labor is included under both categories. This does not result in double counting because this classification is used for purposes of planning and control, not cost accumulation.

For example, if the information presented in Table 1 was allocated based on their relationship to production, prime costs and conversion costs would be computed as follows:

Prime costs:	
Direct materials	$260.000
Direct labor	540,000
Total	$800,000
Conversion costs:	
Direct labor	$540,000
Factory overhead	142.800
Total	$682,800

3- RELATIONSHIP TO VOLUME

Costs vary with changes in the volume of production. Understanding their behavior is vital in almost all aspects of product costing, performance evaluation, and managerial decision making. Because of the importance of cost behavior patterns, we will provide as strong and detailed a foundation as possible of this relationship in this introductory chapter. Costs in relationship to volume are classified as variable, fixed, and mixed. However, it is important to note that the cost behavior patterns we are about to describe are only applicable within a company's relevant range. Relevant range is defined as that interval of activity within which total fixed costs and per unit variable costs remains constant.

Variable costs. Variable costs are those in which the total cost changes in direct proportion to changes in volume, or output, within the relevant range, while the unit cost remains constant. Variable costs are controlled by the department head responsible for incurring them. For example, if variable costs for direct materials are $100 per unit of output, each time output increases by one unit; the variable cost for direct material will increase by $100. The implication for management in its planning and controlling of variable costs is as follows: with all other factors held constant such as selling price per unit and total fixed cost, each desired per unit expansion of productive activity triggers an incremental change in total variable costs equal to a constant amount per unit. As long as the selling price per unit exceeds the variable cost per unit, productive activity should be expanded.

Fixed costs. Fixed costs are those in which total fixed cost remains constant over a relevant range of output, while the fixed cost per unit varies with output. Beyond the relevant range of output, fixed costs will vary. Upper-level management controls the volume of production and is, therefore, responsible for fixed costs. For example, assume that the total fixed cost for rent on a warehouse is $20,000 a year if production is between 5 and 14.99 units. If production is expected to be less than 5 units, a smaller warehouse can be rented at $15,000 a year. Therefore, two relevant ranges exist in this situation; relevant range A. covering from 0 to 4.99 units of output, and relevant range B. covering from 5 to 14.99 units of output. The implication for management in its planning and controlling of fixed cost is as follows: with all other factors held constant, such as selling price per unit and variable cost per unit, productive activity should be expanded as far as possible which will reduce the fixed cost per unit to its lowest amount.

Potential misuse of unitized fixed cost. The fact that fixed cost per unit changes as production changes does not mean that fixed cost should be treated like variable costs. Increasing production volume (within the relevant range) will decrease fixed cost per unit but total fixed costs will not change. For example, assume that at the beginning of year 1, a $40,000 computer was purchased to service Departments A and B. The computer was expected to last 4 years with no salvage value and will be depreciated using the straight-line method. It was projected that 10,000 total computer hours

would be used in year 1 with Department A requiring 6,000 hours and Department B requiring 4,000 hours. The $10,000 annual depreciation ($40,000+ 4 years) was to be allocated to each department based on computer hours used. The cost per computer hour in year I was $1.00 computed as follows:

$$\frac{\$10.000}{10{,}000 \text{ (hours)}} = \$1.00 \text{ per hour}$$

During year I the following computer hours were used:

Department A	6,000 hours
Department B	4,000 hours

The computer depreciation costs allocated to Departments A and B were computed as follows:

Department A (6,000 hours X $1.00) = $6,000
Department B (4,000 hours X $1.00) = 4,000
Total depreciation allocated = $10,000

The above method of handling the allocation of the fixed depreciation costs of the computer appears to be sound. However, consider year 2. During year 2 the following computer hours were used:

Department A	6,000 hours
Department B	2,000 hours

The manager of Department A used the computer for the same amount of hours as in year I and therefore expects that $6,000 will again be allocated to Department A. Instead, Department A is charged with $7,500. Department A used the same number of hours with no change in costs and yet $1,500 more was allocated to it. This ludicrous situation resulted because a fixed cost (depreciation) was improperly allocated as if it were a variable cost. Department A was allocated $7,500 because the total computer hours used in year 2 were only 8,000 (6,000 hours for Department A plus 2,000 hours for Department B). The cost per computer hour in year 2 was $1.25 computed as follows:

$$\frac{\$10,000}{8{,}000 \text{ (hours)}} = \$1.25 \text{ per hour}$$

This avoidable error is, unfortunately, all too common in practice. The responsibility lies with the need for management accountants to help management understand fixed cost behavior from a total and per unit viewpoint so as not to misuse fixed costs especially in their decision making. Continuing our computer cost allocation problem, the annual fixed cost of depreciation should have been allocated using a fixed percentage based on the projected long-run average use by each department. For example, if it was projected that Department A would use the computer 75% of the time and Department B 25% of the time then the fixed costs should be allocated 75% to Department A ($7.500 each year) and 25% to Department B ($2,500 each year) regardless of actual

use. If Department B used the computer less than planned it still should be charged with 25% of the cost because the "capacity" of the computer originally acquired was based on their projected long-run average needs and therefore Department B should be made to bear, in this situation, the full cost of the underutilized computer capacity.

In summary, we have observed the following about the relationship between cost and volume within the relevant range:

1- Total variable costs change in proportion to changes in volume.
2- Per unit variable costs remain constant when volume changes.
3- Total fixed costs remain constant when volume changes.
4- Per unit fixed costs increase (decrease) when volume decreases (increases).

Mixed costs. These costs contain both fixed and variable characteristics over various relevant ranges of operation. Two types of mixed costs exist: semi-variable cost and step cost.

Semi-variable cost. The fixed part of the semi-variable cost usually represents a mini- mum fee for making a particular item or service available. The variable portion is the cost charges for actually using the service. For example, most telephone service charges are made up of two elements; a fixed charge for being allowed to receive or make a phone call, plus an additional or variable charge for each phone call made. Telephone charges are relatively simple to separate into fixed and variable costs; however, in some situations, the variable and fixed components must be approximated. Another example is that a company rents a delivery truck at a flat fee of $2,000 per year plus $.15 for each mile driven. The fixed component is the $2,000 annual rental fee; the variable component is the $.15 for each mile driven. If 10,000 miles are driven during the year, the total annual cost of the delivery truck is $3,500, computed as follows:

Flat fee (fixed component)	$2,000
Mieage charge (variable component) (10.000 miles x $.15)	1,500
Total cost	$3,500

Step cost. The fixed part of step costs changes abruptly at various activity levels because they are acquired in indivisible portions. An example of a step cost is a supervisor's salary. If one supervisor is needed for every 10 workers then two supervisors would be required if, for example, 15 workers are used. If an additional worker is hired (increasing the number of workers to 16) then only two supervisors would still be needed. However, if the number of workers increases to 21 three supervisors would be needed. A step cost is similar to a fixed cost within a very small relevant range.

4- ABILITY TO TRACE

A cost may be considered direct or indirect depending on management's ability to trace them to specific jobs, departments, sales territories, etc.

Direct costs. Costs that management are capable of tracing to specific items or areas. Direct materials and direct labor costs for a specific product are examples of direct costs.

Indirect costs. Costs that are common to many items and are therefore not directly traceable to any one item or area. Indirect costs are usually charged to items or areas based on allocation techniques. For example, indirect manufacturing costs are allocated to products after first being accumulated in a factory overhead cost pool.

5- DEPARTMENT WHERE INCURRED

A department is a major functional division of a business. Costing by departments helps management control overhead costs and to measure income. The following types of departments are found in manufacturing companies:

Production departments. These contribute directly to the production of the item and include departments in which conversion or production processes take place. They include manual and machine operations directly performed on the product manufactured.

Service departments. These are departments which are not directly related to the production of an item. Their function is to provide services for other departments. Examples of service departments are payroll, factory office, personnel, cafeteria, and plant security. The costs of service departments are usually allocated to production departments, since production departments benefit from the services provided.

For example, Company A has only one production department and all the machinery in that department is kept in operating condition by the maintenance department. The maintenance department is also required to provide janitorial and maintenance services to the rest of the company. Therefore, a portion of the maintenance department's cost should be allocated to the production department and will become part of product cost. The portion not allocated to the production department may be allocated to another service department or to a non-plant department, such as the sales department, and will be an expense for the current period of that department.

The basis for allocating service department costs usually varies according to the nature of the service provided. For example, two common bases for allocating service department costs are square feet serviced for a building and grounds service department and number of employees for a personnel service department.

6- FUNCTIONAL AREAS

Costs classified by function are accumulated according to activity performed. All costs of a manufacturing organization may be divided into manufacturing, marketing, administrative, and financing, and are defined as follows:

Manufacturing costs. These are related to the production of an item. Manufacturing costs are the sum of direct materials, direct labor, and factory overhead costs.

Marketing costs. These are incurred in selling a product or service.

Administrative costs. These are incurred in directing, controlling, and operating a company and include salaries paid to management and staff.

Financing costs. These are related to obtaining funds for the operation of the company. This includes the cost of interest that the company must pay on loans, as well as the costs of providing credit to customers.

7- PERIOD CHARGED TO INCOME

Costs may also be classified on the basis of when they are to be charged against revenues. Some costs are first recorded as assets (capital expenditures) and then expensed (charged as an expense) as they are used or expire. Other costs are initially recorded as expenses (revenue expenditures). The classification of costs into categories relating to the periods they benefit aids management in income measurement and in the preparation of financial statements and is essential in matching expenses to revenue in the proper period. Two categories used are product costs and period costs, defined as follows:

Product costs. These are costs directly and indirectly identifiable with the product. They are direct materials, direct labor, and factory overhead. These costs provide no benefit until the product is sold and are, therefore, inventoried upon completion of the product. When the products are sold, the total product costs are recorded as an expense. This expense is called the cost of goods sold. Cost of goods sold is matched against revenue for the period in which the products were sold.

Period costs. Those costs neither directly nor indirectly related to the product are not inventoried. Period costs are charged off immediately because no relationship between cost and revenue can be determined. The following are examples of period costs: an accountant's salary (administrative expense), depreciation on a salesperson's car (marketing expense), and interest incurred on corporate bonds (financing expense).

8- RELATIONSHIP TO PLANNING, CONTROLLING, AND DECISION MAKING

Costs that aid management in the planning, controlling, and decision-making functions are briefly defined as follows:

Standard and budgeted costs. Standard costs are those that should be incurred in a particular production process under normal conditions. Standard costing is usually concerned with per unit costs for direct materials, direct labor, and factory overhead and serves the same purpose as a budget. (A budget is a quantitative expression of management objectives and a means of monitoring progress toward achievement of those objectives.) Budgets, however, usually provide forecasted activity on a total cost basis rather than on a unit cost basis. Standard costs and budgets are used by management first to plan upcoming performance and second to control actual performance through variance analysis (ie., the difference between expected and actual amounts).

Controllable and non-controllable. Controllable costs are those that may be directly influenced by unit managers in a given time period. For example, where managers have the authority of acquisition and use, the cost may be considered to be controllable by them. Non-controllable costs are those costs that are not directly administrated at a given level of management authority.

Committed and discretionary fixed costs. A committed fixed cost arises, of necessity, from having a basic organizational structure (i.e., essential property, plant, equipment, salaried personnel, etc.). It is a long-run phenomenon that usually cannot be adjusted downward without adversely affecting the ability of the organization to operate at even a minimum level of productive capacity. A discretionary fixed cost arises from yearly appropriation decisions for repairs and maintenance costs, advertising costs, executive training, etc. It is a short-run phenomenon that usually can be adjusted downward thereby permitting the organization to operate at any desired level of productive capacity provided for by the committed fixed costs.

Relevant and irrelevant costs. Relevant costs are expected future costs that differ among alternative courses of action and may be eliminated if some economic activity is changed or deleted. Irrelevant costs are unaffected by management's actions. Sunk costs are an example of irrelevant costs. Sunk costs are past costs that are now irrevocable, such as depreciation on machinery. When confronted with a choice, they are not relevant, and should not be considered in a decision-making analysis, except for possible tax effects upon their disposition and "painful" lessons to be learned from past mistakes. Relevancy is not an attribute of a particular cost; the identical cost may be relevant in one circumstance and irrelevant in another. The specific facts of a given situation will dictate which costs are relevant and which are irrelevant.

Differential costs. A differential cost is the difference between the costs of alternative courses of action on an item by item basis. If the cost is increasing from one alternative to another, it is called an incremental cost, and if the cost is decreasing from one alternative to another, it is called a decremental cost. When analyzing a special decision, the key is the differential effects of each option on the company's profits. Frequently, variable costs and incremental costs are the same. However, should a special order, for example, extend production beyond the relevant range, both variable and total fixed costs would increase. In that event, the differential in fixed costs should be included in the decision-making analysis along with the differential in variable costs.

Opportunity costs. Where a decision to pursue one alternative is made, the benefits of other options are foregone. Benefits lost from rejecting the next best alternative are the opportunity costs of the chosen action. Since opportunity costs are not actually incurred, they are not recorded in the accounting records. They are, however, relevant costs for decision-making purposes and must be considered in evaluating a proposed alternative.

Shutdown costs. Shutdown costs are those fixed costs that would be incurred even if there were no production. In a seasonal business, management is often faced with decisions of whether to suspend operations or remain open during the "off-season." In the short run, it is advantageous for the firm to remain open as long as sufficient sales revenue can be generated to cover variable costs and contribute to the recovery of fixed costs. Typical shutdown costs that must be considered when deciding whether to close or stay open are rent, severance pay for employees, storage costs, insurance, and salaries for the security staff.

Summary problem

Communications Manufacturing Company produces CB radios for cars. The following cost information is available for the period ended December 31, 19XX:

Materials put into production: $120,000, of which $80,000 was for direct materials.

Factory labor costs for the period: $90,000, of which $25,000 was for indirect labor.

Factory overhead costs for utilities: $40,000.

Selling, general, and administrative expenses: $60,000.

Required:

Compute the following:

a- Prime costs b- Conversion costs c- Product costs d- Period costs

Solution

a- Prime costs:

Direct materials.	$80,000
Direct labor.	65,000
Total prime costs.	$145,000

b- Conversion costs:

Direct labor.	$65,000
Factory overhead	105,000
Total conversion costs.	$170,000

c- Product costs:

Direct materials cost		$80,000
Direct labor cost		65,000
Factory overhead costs:		
Indirect materials.	$40,000	
Indirect labor	25,000	
Utilities	40,000	105,000
Total product costs.		$250,000

d- Period costs:

Equal to selling, general, and administrative expenses $60,000

Exercises

Multiple choice

1- The term "conversion costs" refers to

a. Manufacturing costs incurred to produce units of output

b. All costs associated with manufacturing other than direct labor and raw material costs

c. Costs which are associated with marketing, shipping, warehousing, and billing activities

d. The sum of direct labor costs and all factory overhead costs

e. The sum of raw material costs and direct labor costs

2- The term "prime costs" refers to

a. Manufacturing costs incurred to produce units of output

b. All costs associated with manufacturing other than direct labor and raw material costs

c. Costs which are predetermined and should be attained

d. The sum of direct labor costs and all factory overhead costs

e. The sum of raw material costs and direct labor costs

3- Costs which are inventoriable are

a. Manufacturing costs incurred to produce units of output

b. All costs associated with manufacturing other than direct labor and raw material costs

c. Costs which are associated with marketing, shipping, warehousing, and billing activities

d. The sum of direct labor costs and all factory overhead costs

e. The sum of raw material costs and direct labor costs

4- The term "variable costs" refers to

a. All costs which may respond to the amount of attention devoted to them by a manager

b. All costs associated with marketing, shipping, warehousing, and billing activities

c. All costs which do not change in total for a given period of time and relevant range but become progressively smaller on a per unit basis as volume increases

d. All manufacturing costs incurred to produce units of output

e. All costs which fluctuate in total in response to small changes in the rate of utilization of capacity

5- The term "committed costs" refers to those

a. Costs which management decides to incur in the current period to enable the company to achieve objectives other than the filling of orders placed by customers

b. Costs which may respond to the amount of attention devoted to them by a manager

c. Costs which are governed mainly by past decisions that established the present levels of operating and organizational capacity and which only change slowly in response to small changes in capacity

d. Costs which fluctuate in total in response to small changes in the rate of utilization of capacity

e. Amortization of costs which were capitalized in previous periods

6- The term "discretionary costs" refers to those

a. Costs which management decides to incur in the current period to enable the company to achieve objectives other than the filling of orders placed by customers

b. Costs which may respond to the amount of attention devoted to them by a manager

c. Costs which are governed mainly by past decisions that established the present levels of operating and organizational capacity and which only change slowly in response to small changes in capacity

d. Amortization of costs which were capitalized in previous periods

e. Costs which will be unaffected by current managerial decisions

7- Those costs referred to as "controllable costs" are

a. Costs which management decides to incur in the current period to enable the company to achieve objectives other than the filling of orders placed by customers

b. Costs which may respond to the amount of attention devoted to them by a manager

c. Costs which are governed mainly by past decisions that established the present levels of operating and organizational capacity and which only change slowly in response to small changes in capacity

d. Costs which fluctuate in total in response to small changes in the rate of utilization of capacity

e. Costs which will be unaffected by current managerial decisions

8- The term "cost" refers to

a. An asset that has given benefit and is now expired

b. The price of products sold or services rendered

c. The value of the sacrifice made to acquire goods or services

d. An asset that has not given benefit and is now expired

e. The present value of future benefits

9- Step costs are classified as a

a. Variable cost

b. Fixed cost

c. Prime cost

d. Conversion cost

e. Mixed cost

10- The term "sunk costs" refers to

a. Past costs that are now irrevocable

b. Costs that are directly influenced by unit managers

c. Costs that should be incurred in a particular production process

d. Costs that may be eliminated if some economic activity is changed or deleted

e. Benefits lost from rejecting the next best alterative

11- COST ELEMENTS

Hill Corporation has the following classifications of cost elements:

a. Production supervisor's salary

b. Cost accountant's salary

c. Fire insurance on factory building

d. Machine operator's wages

e. Packaging for product

f. Raw materials for the product mix

Required: Indicate whether the above cost elements are direct material, direct labor, or factory overhead.

12- FIXED, VARIABLE, AND MIXED COSTS

Some of the categories used by the Broadway Corporation are presented below:

a. Factory rent

b. Wages for employees who are paid based on number of hours worked

c. Factory heat

d. Equipment maintenance

e. Cost accountant's salary

f. Factory supervisor salaries

g. Electricity to run equipment

h. Depreciation (units of production method)

i. Telephone service

Required: Indicate whether the above items represent fixed, variable, semi-variable, or step costs.

13- DIRECT AND INDIRECT MATERIALS

Chewy Chocolate Chip Company uses the following materials to produce its Chocolate Chip Cookies:

a. Bleached flour

b. Sugar

c. Chocolate chips

d. Solvent to clean machines

e. Partially hydrogenated soybean oil

f. Lubricants for machines

g. Eggs

h. Adhesives for cookie boxes

i. Skim milk

Required: Indicate whether the above materials represent direct or indirect materials.

14- REVENUE, EXPENSE, AND LOSS COMPUTATION

The Lu-Lu Manufacturing Company purchased four identical items of inventory for a total cost of $20,000. On May 5, the company sold two of the items for $6.000 each and discarded as worthless the remaining two items of inventory on May 25, because they were found to be defective.

Required: Compute the revenue, expense, and loss from these transactions.

15- ALTERNATIVE LEVELS OF PRODUCTION

The Hi & Lo Zipper Manufacturing Company is considering two alternative levels of production as follows:

Projected production level:	
Plan 1	4,500 units
Plan 2	7,200 units
Fixed costs (relevant range is 3,000-8.000 units)	$20,000
Variable costs.	$2.25 per unit

Required: Compute the production costs under both plans.

16- PRIME COSTS, CONVERSION COSTS, AND PRODUCT COSTS

The following information relates to the Snowball Manufacturing Company:

Direct materials	$25,000
Indirect materials	5,000
Direct labor	30,000
Indirect labor	4,500
Factory overhead (excluding indirect materials and indirect labor)	15,000

Required: Compute the prime costs, conversion costs, and product costs.

17- PROJECTION OF INCOME

Chris's Police Supply Company sells handcuffs to law enforcement agencies. The following income statement was prepared for 19X1

Sales (800 units @ $90)	$72,000
Cost of goods sold (800 units @ $50).	40,000
Gross profit	$32,000
Operating expenses (800 units @ $12.50)	10,000
Operating income	$22,000

Additional Information:

Variable cost of goods sold per unit	$35
Variable operating expenses per unit	5

Required: What would the projected income for 19X2 be for Chris's Police Supply Company if the sales would triple assuming existing facilities would still be adequate and the other variables would not change?

18- COMPUTATION OF VARIOUS COSTS

IOU Manufacturing Company produces wallets. The following cost information is available for the period ended December 31, 19X3:

Materials put into production: $82,000, of which $78,000 direct materials

Factory labor costs for the period: $71,500, of which $12,000 was for indirect labor

Factory overhead costs for factory depreciation: $50,000

Selling, general, and administrative expenses: $62,700

Units completed during the period: 18,000

Required: Compute the following:

a. Prime costs b. Conversion costs c. Product costs d. Period costs

19- EXPENSE, LOSS, AND ASSET COMPUTATION

The PITA Manufacturing Company produced 75,000 units for the year ending December 31, 19X1. No units were in process at the beginning or end of this period. The cost of goods manufactured was $300,000. During the year, the following occurred:

59,000 units were sold at $5 per unit.

14,000 units were still awaiting sale.

2.000 units were found defective.

There was no beginning finished goods inventory.

Required: Prepare a multiple step income statement from the above for PITA Manufacturing Company (ignore income taxes).

20- PRODUCT AND PERIOD COSTS

The Gorilla Company manufactures small stuffed gorillas. The total revenue is $59,000. The company incurred the following costs:

Materials (10% is indirect materials)	$5,200
Labor (12% is indirect labor)	7,000
Factory overhead (including indirect materials and indirect labor)	25,000
General and administrative expenses	14,700
Office salaries	4,800
Equipment purchased at end of period (ignore depreciation)	5,300
Total	$62,000

There were no units still in process at the end of the year, and 92% of the goods produced during the year were sold.

Required: a. Compute what the net income or loss would be if there were no distinction between product and period costs, and Gorilla Company was on a cash basis.

b. Show the analysis that should have been prepared.

c. Compute the correct net income or loss.

21- COMPUTATION OF VARIOUS COSTS

Woody Lumber Manufacturing Company had no units in process on January 1. On December 31, there were 100,000 finished units on hand and no units in process. During the year, 250,000 units had been sold. Materials costing $375,000 had been put into process; 80% were direct materials. Labor costs were $400,000; 65% was direct labor. Additional factory overhead costs were the following:

Heat, light, and power	$160,000
Depreciation	45,000
Property taxes	85,000
Repairs and maintenance	20,000

Selling expenses were $125,000: general and administrative expenses were $80,000.

Required: Compute the following:

a. Prime costs b. Conversion costs c. Product costs d. Period costs

22- COST BEHAVIOR- ORIENTED INCOME STATEMENT

Kevin's Accountants Stationery Supply House sells wood number 2 pencils. The following functionally oriented income statement was prepared for 19X1:

Sales (100,000 dozen @ $.60)	$60,000
Cost of goods sold (100,000 dozen @ $.40)	40,000
Gross profit	$20,000
Operating expenses	50,000
Operating loss	$(30,000)

Additional Information:

Fixed cost of goods sold	$10,000
Fixed operating expenses	25,000

Required: Prepare the 19X1 income statement for Kevin's Accountants Stationery Supply House using the cost behavior-oriented income statement format.

23- REVENUE, EXPENSE, AND LOSS COMPUTATION

Paul and Terry's Gym Supply House began business on January 1. 19X1. During the month of January the following transactions occurred:

	QUANTITY		PER UNIT	
	Purchased	Sold	Purchase cost	Selling price
Description				
Bench press machine	3	2	$500	$800
Lat pull down machine	5	3	400	700
Leg press machine	6	2	600	1,000
Arm curl machine	4	0	200	

The arm curl machines were determined to be defective and will be discarded as worthless. The manufacturer of the arm curl machine went out of business and therefore the machines cannot be returned.

Required: Compute for the month of January:

a. Total revenue b. Total expense (cost of goods sold) c. Total loss

24- EXPENSE, LOSS, AND ASSET COMPUTATION

The Mighty Max Manufacturing Company produces vitamin pills. No production was in process at the beginning or end of this period. The following activity took place during the year 19X1:

Produced

500,000 Vitamin A pills at a cost of $.02 each

300,000 Vitamin B pills at a cost of $.03 each

Sold:

400,000 Vitamin A pills for $.05 each

250,000 Vitamin B pills for 5.06 each

Discarded:

20,000 Vitamin A pills and 10.000 Vitamin B pills because they were past their expiration date.

Other operating expenses were $12,000. There was no beginning finished goods inventory.

Required: Prepare a multiple step income statement from the above for the Mighty Max Manufacturing Company (ignore income taxes).

Chapter Two:

Product Cost Accumulation Systems and External Financial Statements

Chapter Two: Product Cost Accumulation Systems and External Financial Statements

Introduction:

This chapter is devoted primarily to a discussion of product costing. The chapter provides an overview of product cost accumulation systems, external financial statements, and internal reports.

Before the various cost accumulation systems used by manufacturers are considered, a distinction needs to be made between merchandising and manufacturing operations. A merchandiser buys completed goods for resale to customer at a sufficiently high selling price to more than cover the purchase cost plus operating expenses. In contrast, a manufacturer buys materials from various suppliers and converts them into finished goods through the use of direct labor and factory overhead costs. A merchandiser's income statement reflects the purchase of goods for resale; a manufacturer's income statement reflects the production of goods for resale.

Another important distinction between merchandising and manufacturing lies in the accounting for inventories. A merchandising concern has only an inventory of goods bought and held for resale; a manufacturing concern has raw materials, work-in-process, and finished goods inventories, which are defined as follows:

Raw materials inventory: refers to the cost of raw materials that have not yet been put into production and are still available for use at the end (or beginning) of a period.

Work-in-process inventory: represents the cost of incomplete goods still in production at the end (or beginning) of a period.

Finished goods inventory: contains the cost of completed goods on hand at the end (or beginning) of a period.

Cost Accumulation: Periodic and Perpetual systems

The accumulation and classification of product cost data are very important tasks. Cost accumulation is the organized collection of cost data via a set of procedures or systems. Cost classification is the grouping of all manufacturing costs into various categories in order to meet the needs of management. Proper cost accumulation provides management with a basis for predicting the economic consequences of its decisions. Some of these decisions include the following:

1. Which products should we manufacture?
2. Should we expand or reduce a department?
3. What selling prices should we set?
4. Should we diversify our product lines?

Cost data are accumulated under either a periodic cost accumulation system or a perpetual cost accumulation system.

A periodic cost accumulation system provides only limited product cost information during a period and requires quarterly or year-end adjustments to arrive at the cost of goods manufactured. In most cases, the additional ledger accounts needed are simply added to a financial accounting system. Periodic physical inventories are taken to adjust inventory accounts to arrive at the cost of manufactured goods. *A periodic cost accumulation* system is not considered a complete cost accumulation system since the costs of raw materials, work - in - process, and finished goods can only be determined after physical inventories are taken. Because of this limitation, periodic cost accumulation systems generally used only by small manufacturing companies.

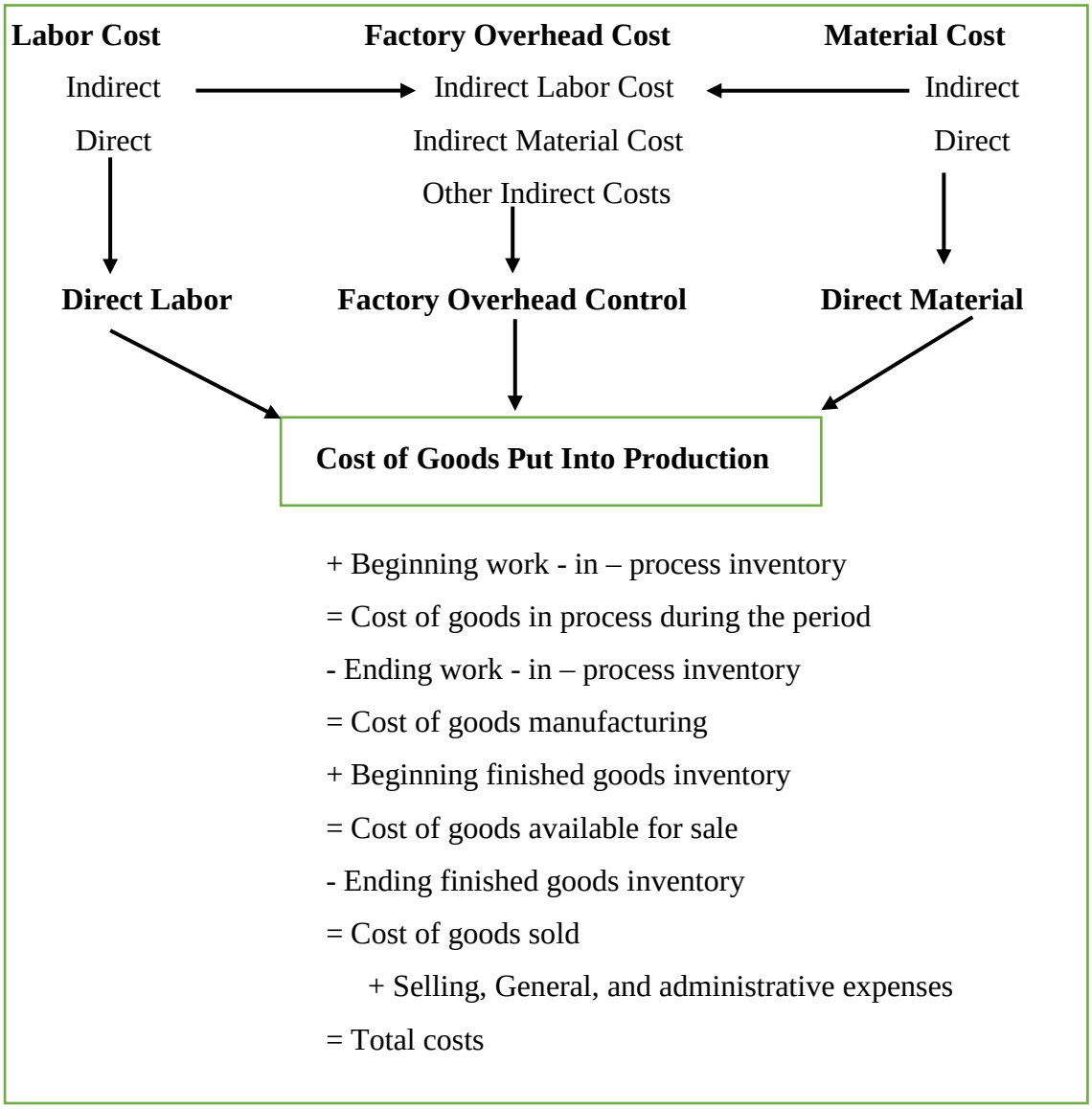
A perpetual cost accumulation system is a vehicle for accumulating product cost data, through the three inventory accounts that provide continuous information about raw materials, work-in-process, finished goods, cost of manufactured goods, and cost of goods sold. Such cost system is usually very extensive and are used by most medium and large manufacturing companies.

❖ *Periodic cost accumulation system*.

The first step in comprehending a periodic cost accumulation system is to understand the flow of costs as goods pass through the various stages of production. The flow of costs in a manufacturing company, under a periodic cost accumulation system, is shown in figure 1. The cost of goods put into production (direct materials + direct labor + factory overhead) plus the cost of work - in - process inventory at the beginning of the period equals the cost of goods in process during the period. In order to determine the cost of goods manufactured, the cost of ending work-in-process inventory is subtracted from the cost of goods in process during the period. The cost of goods manufactured plus beginning finished goods inventory equals the cost of goods available for sale. When the ending finished goods inventory is deducted from this figure, the cost of goods sold

results. The total operating costs can now be computed by adding selling, general, and administrative expenses to the cost of goods sold.

Figure 1: Flow of costs; Periodic cost system



Example: Assume the following information for a period**.**

Materials cost:

Direct ……...… $ 60,000

Indirect …… 20,000

$ 80,000

Labor cost:

Direct …… $18,000

Indirect……...… $17,000

$35,000

Other indirect manufacturing costs:

Power and heat…….....30,000

Selling, general, and administrative expenses……...… 10,000

Inventories (in dollars):*

Beginning:

Work - in - process ……. 2,000

Finished goods ……...……15,000

Ending:

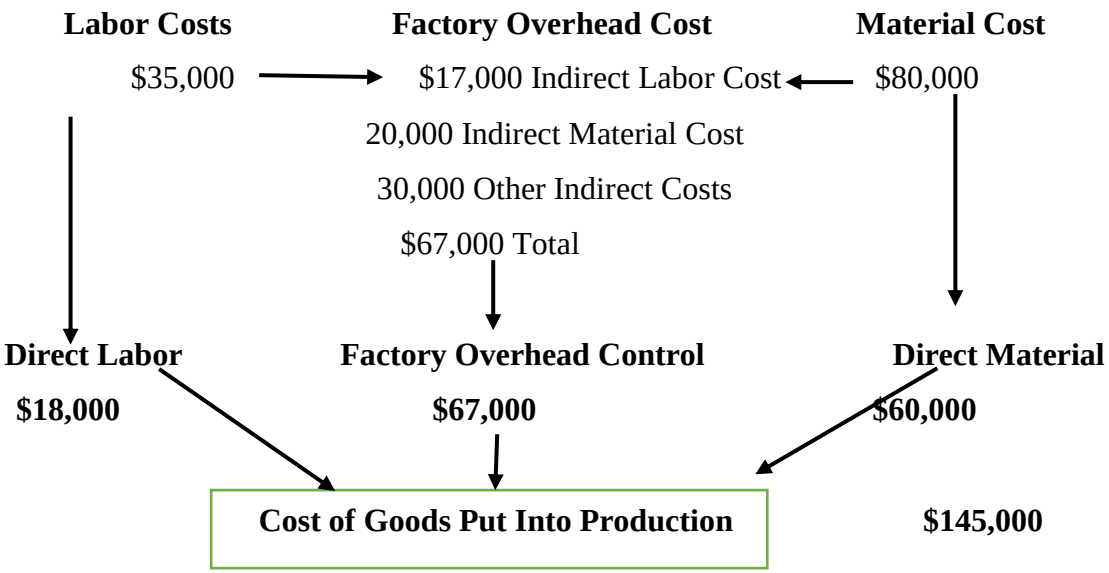
Work - in - process ……..……8,000

Finished goods…….…… 20,000

* Assume no beginning or ending raw materials inventory.

Figure 2 presents the computation of costs based on the preceding information.

Figure 2: Computation of Costs in a periodic cost accumulation system



+ Beginning work - in – process inventory	2,000
= Cost of goods in process during the period	$147,000
- Ending work - in – process inventory	8,000
= Cost of goods manufacturing	$139,000
+ Beginning finished goods inventory	15,000
= Cost of goods available for sale	$154,000
- Ending finished goods inventory	20,000
= Cost of goods sold	$134,000
+ Selling, General, and administrative expenses	10,000
= Total costs	$144,000

The perpetual cost accumulation systems provide much better control and more readily available information for managerial decision making than do periodic cost accumulation systems.

❖ Perpetual Cost Accumulation Systems.

Perpetual cost accumulation systems are designed to provide relevant information to management on a timely basis to aid in planning and control decisions. The major objective in such systems, as was the case with periodic cost accumulation systems, is the accumulation of total costs and the computation of unit costs.

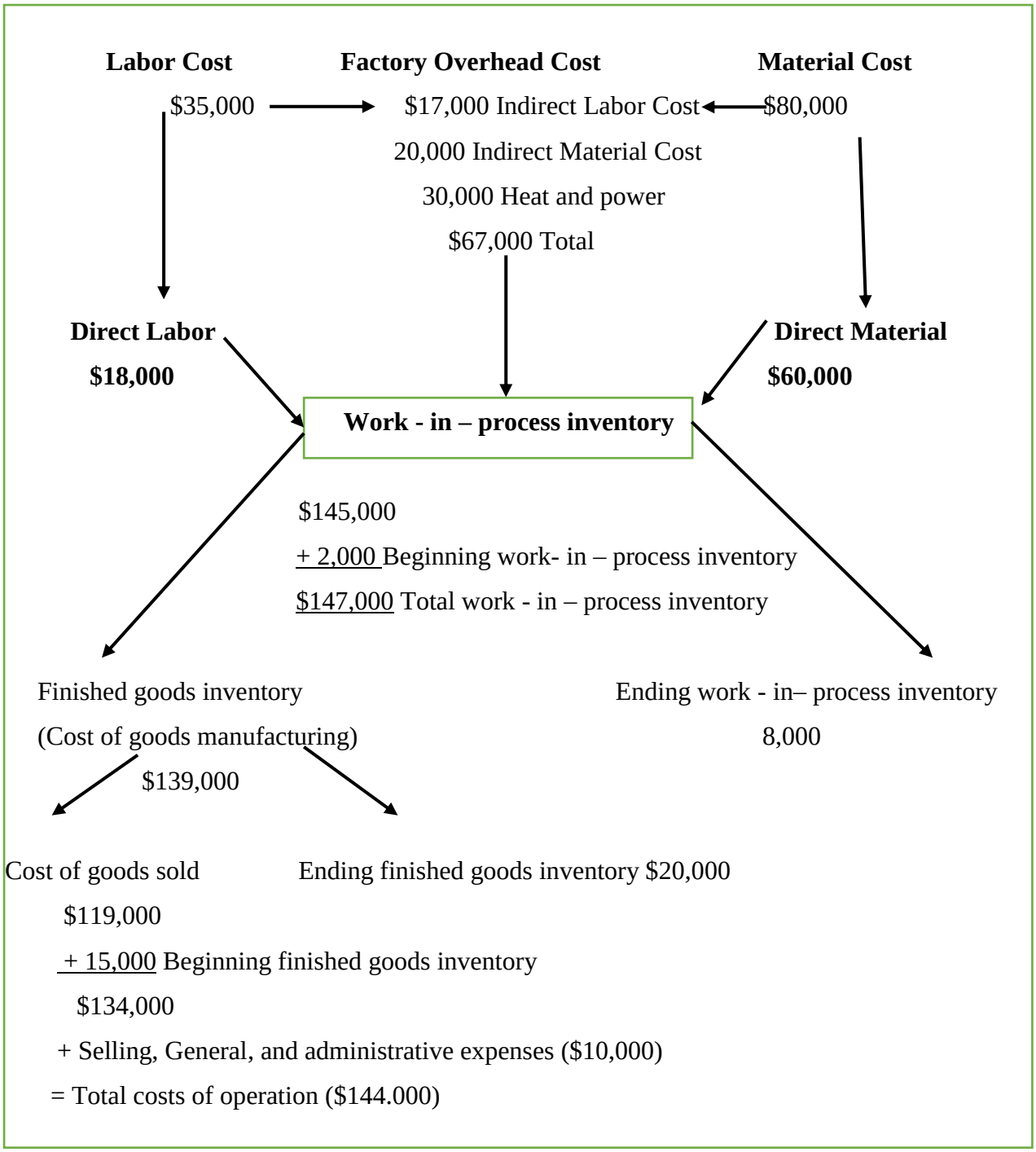
In a perpetual cost accumulation system, the cost of direct materials, direct labor, and factory overhead must first flow through work-in-process inventory in order to reach finished goods inventory. The total costs transferred from work - in - process inventory to finished goods inventory during the period equal the cost of goods manufactured. The ending work - in – process inventory is the balance of unfinished production at the end of the period. As goods are sold, the cost of the goods sold is transferred from the asset account Finished Goods Inventory to the expense account Cost of Goods Sold. The ending finished goods inventory is the balance of unsold production at the end of the period. The total expenses equal the cost of goods sold plus selling, general, and administrative expenses.

Note that in a perpetual cost accumulation system, information is continuously available concerning raw materials inventory, work-in-process inventory, finished goods inventory, cost of goods manufactured. And cost of goods sold, instead of only at the end of the period as with a periodic cost accumulation system.

The flow of costs through a perpetual cost accumulation system is presented in Figure 3 (using the same cost information provided in Figure 2).

Two basic types of perpetual cost accumulation systems, classified according to the type of manufacturing process, are job orders and process costing.

Figure 3 Flow of Costs; Perpetual cost system



Job Order Cost Accumulation system:

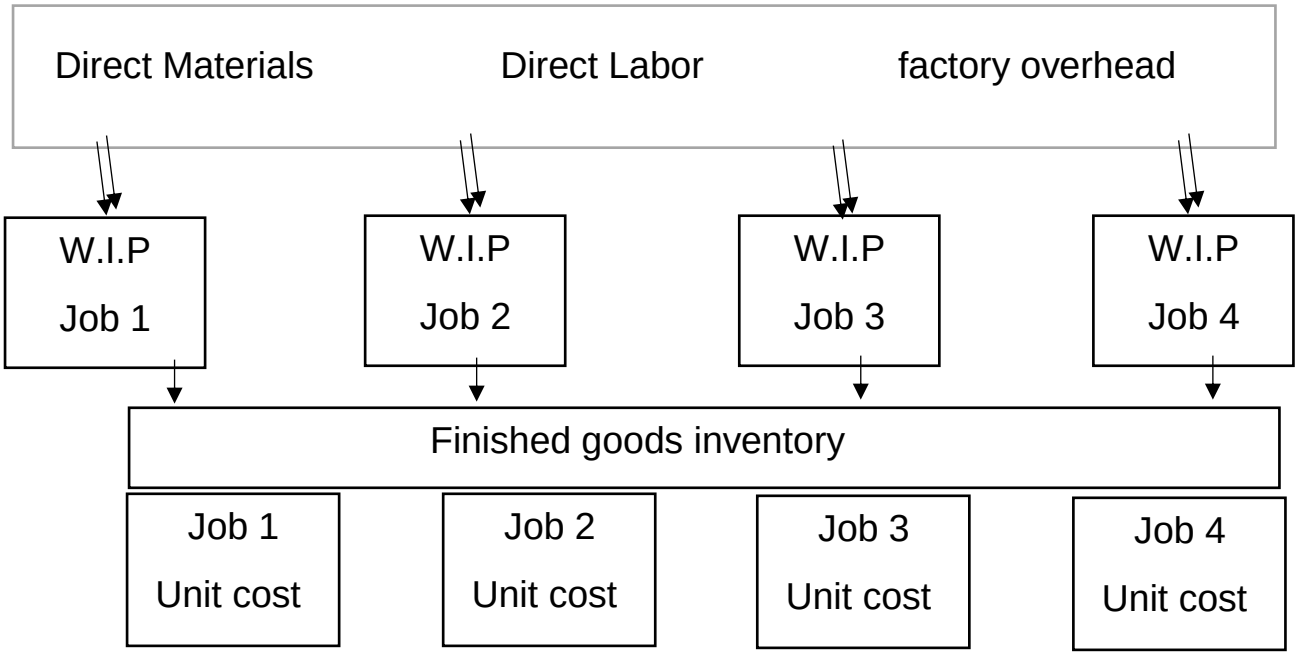
A job order cost accumulation system is most suitable where a single product or batch of products is manufactured according to a customer's specifications, that is, each job is "custom made", with the agreed-upon selling price closely tied to estimated cost. Job costing is a costing system that accumulates costs and assigns them to specific jobs, customers, project, or contracts. A job order cost system is most suitable where the products manufactured differ in materials and conversion requirements. The cost incurred in manufacturing a particular job must therefore be matched to the goods produced.

Job order costing systems provide information important to managing profitability and setting prices for output. Custom manufactures typically price their goods using two methods. A cost- plus contract may be used, which allows producers to cover all direct costs and some indirect costs and to generate an acceptable profit margin. In other cases, producers may use a competitive bidding technique. In such instances, the company must accurately estimate the costs of making the unique products associated with each contract; otherwise, the company can incur significant losses when actual costs exceed those that were estimated during the bidding process.

Under a job order cost system, the three basic elements of a product's cost - direct materials, direct labor, and factory overhead - are accumulated according to identifiable jobs. Individual work-in-process inventory accounts are set up for each job and are charged with the cost incurred in the production of the specifically ordered unit(s). The unit cost for each job is computed by dividing the total number of units in the job into the total cost accumulated in that job's work-in-process inventory account upon its completion and prior to its transfer to finished goods inventory.

Figure 4 presents a diagram of a job order cost system.

Figure 4 : Job order cost accumulation system



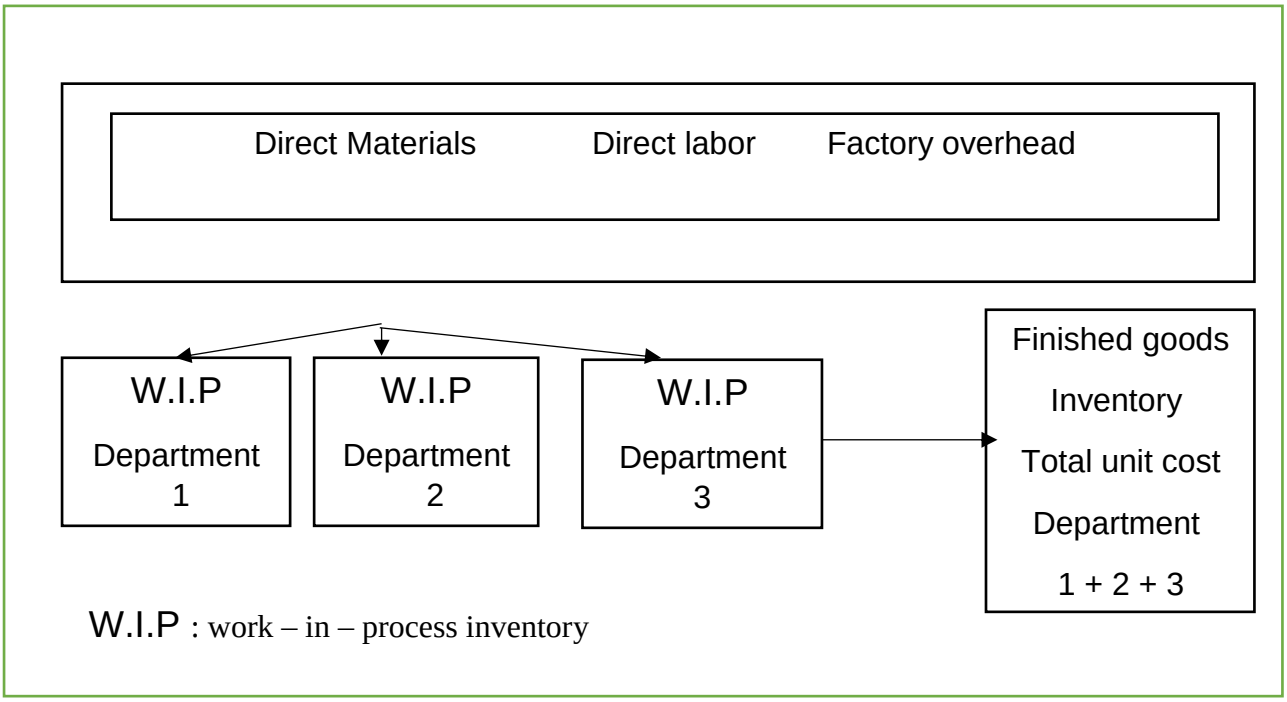
W.I.P. is work – in – process – inventory

Process Cost Accumulation System

A process cost accumulation system is used when products are manufactured by either mass production techniques or continuous processing. Process costing is suitable when homogeneous products are manufactured in large volumes. Process costing uses an averaging technique to assign costs to units produced during the period. Under a process cost system, the three basic elements of a product's cost - direct materials, direct labor, and factory overhead - are accumulated according to departments or cost centers. A department or cost center is a major functional division in a factory where related manufacturing processes are performed. Individual work-in-process inventory accounts are set up for each department and are charged with the costs incurred in the processing of the units that pass through them. The unit cost is computed for a department (instead of for a job) by dividing total units processed by the department into the total cost accumulated in that department's work-in-process inventory account upon its completion and prior to its transfer to a subsequent department. The total unit cost for the finished product is the sum of the unit costs of all the departments.

Figure 5 presents a diagram of a process cost system.

Figure 5 Process cost accumulation system



Alternative product Costing Systems:

- **Absorption Costing and Direct Costing**

A. Absorption Costing

Figure 6 presents Cordell's income statement using the absorption approach (or absorption costing), the method used by companies for external financial reporting. Firms that take this approach consider all direct and indirect manufacturing costs (both variable and fixed) to be product (inventoriable) costs that become an expense in the form of manufacturing cost of goods sold only when the firm sells the related product.

Note that gross profit or gross margin is the difference between sales and the manufacturing cost of goods sold. Note too that the primary classifications of costs on the income statement are by three major management functions: manufacturing, selling, and administrative.

Figure 6 Cordell Company Predicted Absorption Income

Statement for the Year Ended December 31, 20X1 (thousands of dollars)

Sales……		$40,000
Less: Manufacturing cost of goods sold……		
Direct materials……..	$14,000	
Direct labor……	6,000	
Indirect manufacturing (Schedules 1 plus 2)*……....	10,000	30,000
Gross margin or gross profit……...		$ 10,000
Selling expenses (Schedule 3)…….	$ 6,000	
Administrative expenses (Schedule 4)…….	2,000	
Total selling and administrative expenses…….		$ 8,000
Operating income……...		$ 2,000

*Schedules 1 and 2 are in **Figure 2**. Schedules 3 and 4 are in **Figure 3**.

B. Direct Costing

In contrast, Figure 7 presents Cordell's income statement using the contribution approach (also called variable costing or direct costing). For decision purposes, the major difference between the contribution approach and the absorption approach is that the former emphasizes the distinction between variable and fixed costs. Its primary cost classification is by variable- and fixed-cost behavior patterns, not by business functions. Note that it is difficult to classify a given cost as variable, fixed, or mixed (for example, repairs), so often approximations must suffice.

The contribution income statement provides a contribution margin—revenue less all variable costs, including variable selling and administrative costs. This approach makes it easier to understand the impact of changes in sales volume on operating income.

Another major benefit of the contribution approach is that it stresses the role of fixed costs in operating income. Before a company can earn income, its total contribution margin must exceed the fixed costs it has incurred for manufacturing and other value-chain functions. This highlighting of contribution margin and total fixed costs focuses management attention on cost behavior and control in making both short-run and long-run decisions. Remember that advocates of the contribution approach do not maintain that fixed costs are unimportant or irrelevant. They do stress, however, that the distinctions between behaviors of variable and fixed costs are crucial for certain decisions. Decisions usually affect fixed costs in a different way than they affect variable costs.

Figure 7 Cordell Company Predicted Contribution Income Statement for the Year Ended December 31, 20X1 (thousands of dollars)

Sales…….		$40,000
Less: Variable expenses…….		
Direct materials……...	$14,000	
Direct labor…….	6,000	
Variable indirect manufacturing costs (Schedule 1)*…..	4,000	
Total variable manufacturing cost of goods sold……	$24,000	
Variable selling expenses (Schedule 3)……...	2,000	
Variable administrative expenses (Schedule 4)……...	200	
Total variable expenses……		$ 26,200
Contribution margin…….		**$ 13,800**
Less: Fixed expenses……		
Manufacturing (Schedule 2)……..	$ 6,000	
Selling (Schedule 3)……	4,000	
Administrative (Schedule 4)……	1,800	11,800
Operating income……...…….		$ 2,000
*Note: Schedules 1 and 2 are **Figure 2**. Schedules 3 and 4 are in **Figure 3**.		

The distinction between the gross margin (from the absorption approach) and the contribution margin (from the contribution approach) is important, especially for manufacturing companies. Consider the following computations of contribution margin (CM) and gross margin (GM):

CM/unit = Price - (Variable manufacturing cost/unit + Variable selling & admin. cost/unit)

GM/unit = Price - (Variable manufacturing cost/unit + Fixed manufacturing cost/unit)

The variable selling and administrative cost per unit affects the contribution margin but not the gross margin, while the fixed manufacturing cost affects the gross margin but not the contribution margin. Because fixed manufacturing costs do not change with small changes in volume of units, it can be misleading to express such costs on a per unit basis. Thus, it can be misleading to use gross margin to predict the effect of changes in volume.

C. Comparing Direct and Absorption costing

The direct (contribution) costing separates fixed costs from variable costs. It deducts variable costs from sales to compute a contribution margin and then deducts fixed costs to measure profit. In contrast, the absorption costing separates manufacturing costs from nonmanufacturing costs. It deducts manufacturing costs from sales to compute a gross margin and then deducts nonmanufacturing costs to measure profit.

Both formats can be relevant for decision making, depending on the type of decision being contemplated. In situations where decisions affect variable costs differently than they affect fixed costs, such as the short-run pricing decisions we will discuss in this chapter, the contribution costing will yield great value. In contrast, the absorption costing is well suited for long-run pricing decisions, where it is important that the prices over a product's life cover all manufacturing costs, including fixed costs.

Regulators do not allow the contribution costing for external financial reporting. However, many companies use the contribution costing for internal decision-making purposes and an absorption format for external purposes. Why? Because they expect the benefits of making better decisions using the contribution approach to exceed the extra costs of using two different reporting systems simultaneously.

External Financial Statements and Internal Reports

The principal contact that most people, other than accountants, have with accounting information is through published statements are generally the basis for investment decisions by stockholders, for lending decisions by banks and other financial institutions, and for credit decisions by vendors. For this reason, financial accounting is concerned with the proper recording summarizing, and presenting of assets. Liabilities, owners' equity, and profits or losses. Financial information prepared for external use is therefore closely regulated to protect the interests of external users.

All financial information published for external use must be presented in accordance with generally accepted accounting principles (GAAP). For example, property, plant, and equipment are recorded in historical dollars as required by GAAP. Thus a tract of land purchased for a plant site in 19X9 for $7,000 is corded at its purchase price. That amount is maintained on the books until the property is resold, despite any appreciation in real estate values.

For internal purposes, however, the current market value or replacement value may be more useful than the amount originally paid. For example, the current market value or replacement value of a machine may be more helpful than its original cost if management wishes to determine the current rate of productivity of the old machine versus the projected rate of productivity of a new

machine. Management has great flexibility in using cost information for a wide variety of purposes in the planning and control of the company. Cost accounting information is far less restricted by outside influences than is financial accounting information and thus is more responsive to management needs.

Cost accounting is also more flexible with respect to the basis of measurement when used for internal operations. The basis of measurement for operations may be monetary (historical, present, or future dollars) or physical (labor hours, machine hours, or units produced), For example, management may wish to analyze the efficiency of workers in the factory, the cost data needed for this analysis may include the following:

1- A breakdown of hours worked by department, product, or process.
2- Hourly rates by worker classification.
3- Total labor hours and total labor dollars.
4- Labor hours of idle time.

The summarized cost information which will ultimately be used in external financial statements must adhere to generally accepted accounting principles.

Financial statements for external use generally must be prepared at least annually for stockholders, the Securities and Exchange Commission (SEC), the Internal Revenue Service (IRS), and to comply with other reporting requirements. Some companies are required by the SEC to report financial information quarterly. Thus, information for external use is often reported at intervals established by outside agencies. In contrast, cost accounting reports are required at various intervals-weekly, biweekly, monthly-according to the needs of management. The nature of the reports and the content are determined by management. These periodic reports from the basis for annual reports. Furthermore, many non-routine studies and analyses are conducted for management on a one time basis.

Financial statements published for external use include statements of financial position (balance sheet), statement of income (income statement), statement of retained earnings, statement of cash flows, and statement of changes in stockholders' equity. While historical cost is the basis for the primary statements, certain large, publicly held enterprises voluntarily disclose supplementary information on a current cost basis (current purchased price of an asset owned). Segmented information (operations in different industries, countries, and major customer) may also be required for certain enterprises.

External Financial Statements

The previously mentioned external financial statements provide vital information for external users such as creditors and investors. Another source of information for external users that must be prepared by manufacturing firms is the cost of goods manufactured statement.

In its basic from, a cost of goods manufactured statement may appear as in Table 1. The amount of cost of goods manufactured appearing at the bottom of the statement also appears on the income statement in the cost of goods sold section, as in Table 2. Note that the account called "Cost of Goods Manufactured" is treated on the income statement of a manufacturing company the same way that the Purchases account is treated on the income statement of a merchandising company.

The interrelationship of the cost of goods manufactured statement, the income statement, the statement of retained earnings, and the balance sheet is presented in Table 3. The statement of cash flows (not presented in Table 3) is based on the income statement and balance sheet and any relevant additional information.

Table 1 Production Company: Cost of Goods Manufactured Statement, for the Year Ended 31/12/XO

Costs put into production during the period:	
Direct materials……..……...X	
Direct labor……..X	
Factory overhead…….....X	
Total costs put into production……..XX	
Plus: Work-in-process inventory at the beginning of the period……..…X	
Cost of goods in process during the period……...XX	
Less: Work-in-process inventory at the end of the period……(X)	
Cost of goods manufactured ……X X	

Table 2 Production Company: Income Statement for the Year Ended 12/31/XO

Sales		X
Cost of goods sold:		
Opening finished goods inventory	X	
Plus: Cost of goods manufactured	X	
Goods available for sale	X	
Less: Closing finished goods inventory	(X)	
Cost of goods sold		(X)
Gross profit		XX
General, selling, and administrative expenses		(XX)
Net income		XXX

Table 3 Interrelationship of Financial Statements

Trial Balance		
	Debit	**Credit**
Cash	$ 30000	
Receivables	4000	
Inventories-opening balance:		
Work-in-process	10000	
Finished goods	7000	
Other assets (noncurrent)	10000	
Total Liabilities (current)		$ 22000
Capital stock		4000
Additional paid-in capital		6000
Retained earnings-opining balance		20000
Added to work-in- process inventory during the period		
Direct materials	3000	
Direct labor	2000	
Factory overhead	4000	
Sales		50000
Marketing expenses	9000	
Administrative expenses	6000	

Other income		3000
Other expenses	5000	
Income taxes	9000	
Dividends	6000	
Total	$ 105.000	$ 105.000
Additional information:		
Closing inventories:		
Work-in-process	$ 7000	
Finished goods	6000	
Cost of Goods Manufactured Statement		
Costs put into production during the period		
Direct materials	$ 3000	
Direct labor	2000	
Factory overhead	4000	
Total costs put into production		$ 9000
Plus: Work-in- process inventory at the beginning of the period		10000
Costs of goods in process during the year		$ 19000
Less: work-in- process inventory at the end of the period		(7000)
Cost of goods manufactured		$ 12000
Income Statement		
Sales		$ 50000
Cost of goods sold:		
Opining finished goods sold inventory	$ 7000	
Plus: Cost of goods manufactured	12000	
Goods available for sale	$ 19000	
Less: closing finished goods sold inventory	(6000)	
Cost of goods sold		13000
Gross profit		$ 37000
Less: Marketing and Administrative expenses:		
Marketing expenses	$ 9000	
Administrative expenses	6000	(15000)
Income from operations		$ 22000

Non-operating income and expenses		
Other income	$ 3000	
Other expenses	(5000)	(2000)
Income before taxes		$ 20000
Income taxes		(9000)
Net income		11000
Statement of Retained Earnings		
Retained earnings-operating balance		$ 20000
Plus: Net income		11000
Subtotal		$ 31000
Less: Dividends		(6000)
Retained earnings-closing balance		$ 25000
Balance Sheet		
Assets		
Current:		
Cash	$ 30000	
Receivables	4000	
Work-in-process inventory	7000	
Finished goods inventory	6000	$ 47000
Noncurrent		
Other assets		10000
Total assets		$ 57000
Liabilities and stockholders' Equity		
Total current liability		$ 22000
Stockholders' equity		
Capital stock	$ 4000	
Additional paid-in capital	6000	
Retained earnings-closing balance	25000	35000
Total liabilities and stockholders' equity		$ 57000
For briefness, it is assumed there is no opening or closing materials inventory.		

A more detailed cost of goods manufactured statement, including materials inventory, for the XYZ. Manufacturing Company appears in Table 4.

Another common format of the cost of goods manufactured statement, whereby beginning work-in process inventory is added first at the top of the statement and ending work-in-process inventory is deducted as the last item at the bottom of the statement, is presented in Table 5 for the XYZ Manufacturing Company.

The format used in external financial statements will not be affected by the product costing technique selected. For example, the format of the cost of goods manufactured statement used by a custom maker (job order costing) will be the same as the one prepared by a mass producer (process costing).

Table 4 Cost of Goods Manufactured Statement for the Year Ended 12/31/19X2

Costs put into production during the period		
Direct materials:		
Materials inventory, January 1, 19X2.	$ 700000	
Purchases	42000	
Materials available for use	$ 742000	
Materials inventory, December 31, 19X2.	(34000)	
Materials used	$ 708000	
Less: Indirect materials	(34650)	
Direct materials used		$ 673350
Direct labor		676240
Factory overhead:		
Indirect materials	$ 34650	
Indirect labor	59217	
Heat	75000	
Light	47000	215867
Total costs put into production		$ 1565457
Plus: Work-in- process inventory at the beginning of the period		400000
Costs of goods in process during the period		$ 1965457
Less: work-in- process inventory at the end of the period		(200000)
Cost of goods manufactured		$ 1765457

Table 5 Cost of Goods Manufactured Statement. For the Year Ended 12/31/X2

Work-in- process inventory at the beginning of the period		$ 400000
Costs put into production during the period		
Direct materials:		
Materials inventory, January 1, 19X2.	$ 700000	
Purchases	42000	
Materials available for use	$ 742000	
Materials inventory, December 31, 19X2.	(34000)	
Materials used	$ 708000	
Less: Indirect materials	(34650)	
Direct materials used		$ 673350
Direct labor		676240
Factory overhead:		
Indirect materials	$ 34650	
Indirect labor	59217	
Heat	75000	
Light	47000	215867
Total costs put into production		$ 1565457
Costs of goods in process during the period		$ 1965457
Less: work-in- process inventory at the end of the period		(200000)
Cost of goods manufactured		$ 1765457

Summary Problems

Summary Problem (1)

King Manufacturing Corporation has the following information relating to the period just ended:

Beginning work-in- process inventory	$ 25000
Ending work-in- process inventory	10000
Direct materials cost	95000
Direct labor cost	110000
Factory overhead costs	70000
Beginning finished goods inventory	15000
Ending finished goods inventory	45000
Sales	300000
Selling and general expenses	75000

Required: From the preceding information, compute the following:

a- Cost of goods manufactured

b- Cost of goods sold

c- Net income or loss

Solution

(a) Cost of goods manufactured:

Costs put into production during the period:	
Direct materials cost	$ 95000
Direct labor cost	110000
Factory overhead costs	70000
Total costs of goods put into production	$ 275000
Plus: Beginning work-in-process inventory	25000
Cost of goods in process during the period	$ 300000
Less: Ending work-in-process inventory	10000
Cost of goods manufactured	$ 290000

(b) Cost of goods sold

Beginning finished goods inventory	$ 15000
Plus: Cost of goods manufactured	290000
Goods available for sale	$ 305000
Less: Ending finished goods inventory	45000
Cost of goods sold	$ 260000

(c) Net income or loss

Sales	$ 300000
Less: Cost of goods sold	260000
Gross profit	$ 40000
Less: Selling and general expenses	75000
Net loss	($ 35000)

Summary Problem (2)

The following information is available for The Silverman Company on December 31, Year 3:

Raw materials		Labor costs	
Inventory, January 1	$9000	Direct	$19000
Inventory, December 31	12000	Indirect	$17000

Additional Information:

Heat and electricity for the factory	$ 25000
Materials purchased during the year	40000
Costs of goods in process during the year	103000
Work-in- process inventory, December 31	7000
Sales	125000
Finished goods inventory, January 1	25000
Costs of goods sold	105000
Selling, general and administrative expenses	11000

All materials are considered direct materials.

Required: Prepare a statement of cost of goods manufactured and an income statement.

Solution

Statement of Cost of Goods Manufactured, for the Year Ended December 31, Year 3

Direct materials:		
Inventory, January 1	$ 9000	
Purchase of direct materials	40000	
Total materials available	$ 49000	
Less: Inventory, December 31	12000	
Direct materials used		$ 37000
Direct labor		19000
Factory overhead:		
Indirect labor	$ 17000	
Heat and electricity	25000	42000
Total manufacturing costs		$ 98000
Plus: Work-in-process inventory, January 1		5000
Cost of goods in process during the year		$ 103000
Less: Work-in-process inventory, December 31		7000
Cost of goods manufactured		$ 96000

Income Statement for the Year Ended December 31, Year 3

Sales			$ 125000
Cost of goods sold:			
Finished goods inventory, January 1	$ 25000		
Plus: Cost of goods manufactured	96000		
Goods available for sale	$ 121000		
Less: Finished goods inventory, December 31 ($121000-105000)	16000		
Cost of goods sold			105000
Gross profit			$ 20000
Less: Selling, general, and administrative expenses		11000	
Net income			$ 9000

Exercises

1- The cost of goods manufactured, under a periodic cost accumulation system, is equal to the:

a- Beginning finished goods inventory plus purchases.

b- Beginning work-in-process plus cost of goods in process during the year.

c- Cost of goods put into production + beginning work-in-process -- ending work-in-process.

d- Cost of goods sold less beginning work-in-process.

2- The cost of goods sold under a periodic cost accumulation system is equal to the:

a- Cost of goods available for sale less ending finished goods inventory.

b- Cost of goods available for sale plus beginning finished goods inventory.

c- Cost of goods manufactured plus beginning finished goods inventory.

d- Cost of goods manufactured less beginning finished goods inventory.

3- Under a perpetual cost accumulation system, the cost of direct materials. Direct labor, and factory overhead must first flow through the:

a- Finished goods account.

b- Work-in-process account.

c- Cost of goods sold account.

d- Cost of goods manufactured account.

4- A job order cost accumulation system is most suitable where:

a- Mass production techniques are used.

b- Homogeneous products are produced.

c- Continuous processing is performed.

d- Customized products are produced.

5- In a process cost system. The unit cost is computed for a:

a- Job.

b- Batch of goods.

c- Department.

d- Category of goods.

6- Which of the following is a cost behavior-oriented approach to product costing?

a- Absorption costing.

b- Process costing.

c- Direct costing.

d- Job order costing.

7- Which of the following is not an example of a normally issued external financial statement?

a- Statement of financial position.

b- Statement of performance evaluation.

c- Statement of results of operations.

d- Statement of retained earnings.

8- The amount of cost of goods manufactured appearing on the bottom of the cost of goods manufactured statement also appears on the:

a- Statement of financial position.

b- Statement of performance evaluation.

c- Statement of results of operations.

d- Statement of retained earnings.

9- Sparkling Seltzer, Inc. bottled 200,000 gallons of seltzer water at a total cost of $56,000. Assuming that 75% of the bottled seltzer is sold, what is the unit cost of the seltzer and the total cost of the ending finished goods inventory, respectively?

a- $.07 per quart: $14,000

b- $.28 per gallon; $14,000

c- $.28 per gallon; $42,000

d- $.07 per quart; $42,000

10- Lehmann Manufacturing Corporation has the following information for the period just completed:

Direct materials……. ……..$65000

Direct labor…… ……...74000

Factory overhead... ……?

Beginning work-in-process inventory.....31000

Ending work-in-process inventory.....37680

Beginning finished goods inventory. …..….46000

Ending finished goods inventory.....22000

Additional information: Last year total operating costs were $256,000. This year's total operating costs, of which 18% constitute selling, general, and administrative expenses, are $30,000 lower than last year's. What amount represents factory overhead?

a- $29,000 b- $34,300

c- $47,000 d-$53,600

11- The accumulation of total costs and the computation of unit costs are the primary objective of:

a- A perpetual cost accumulation system.

b- A periodic cost accumulation system.

c- Both a periodic and a perpetual cost accumulation system.

d- A job order cost accumulation system.

e- Neither a periodic nor a perpetual cost accumulation system.

12- Hogan Manufacturing Company uses a process cost system. During the period $139,000 worth of produced goods were transferred to finished goods inventory.

Additional information:

Beginning finished goods inventory	$14,000
Ending finished goods inventory	18,000
Total cost of operation	164,000
Selling general and administrative expenses	12,000

What is Hogan Manufacturing Company's cost of goods manufactured?

a- $157,000 b- $ 139,000

c- $ 138,000 d- $152,000

13- Which statement, if any, is incorrect?

a- Direct costing is a behavior-oriented approach because product costs are all variable by nature under direct costing and a direct relationship between cost and output can thus be maintained.

b- Both direct and absorption costing methods are suitable for use in a job order cost system or in a process cost system.

c- For purposes of external financial reporting, absorption costing must be used.

d- Ignore the question's wording. All statements are correct.

14- Lloyd Company has just contracted to sell 1,000 units of product X to Epson Company for a 12% profit over estimated cost. Lloyd company most likely uses a:

a- Job order cost system.

b- Direct cost system.

c- Process cost system.

d- System that cannot be determined from the information given.

15- Jerry's Pretzel Company uses a process cost system. The pretzel products are completed after they have been through each of Jerry's three manufacturing departments. This month's departmental unit cost information follows:

Unit Costs

Department 1 …..... $.14

Department 2 …..... $.39

Department 3…..... $.09

Production for the month was 10,000 packages of pretzels. During the month. Jerry's Pretzel Company incurred $500 of selling and administrative expenses.

What is the total unit cost of a pretzel package?

a- $0.21 b- $0.67

c- $0.62 d- $0.57

16- The following data relate to Lendl Manufacturing Company for the period:

Direct labor	$ 2,400
Factory overhead	1,700
Work-in-process inventory at end of period	5,000
Cost of goods manufactured	16,000
Sales	50,000
Opening finished goods inventory	9,000
Closing finished goods inventory	8,000
Total selling, general, and administrative costs	14,000

What is the cost of direct materials put into production during the period? By what amount will retained earnings increase (assuming no taxes or dividends)?

a- $ 6,700; $14,000 c- $ 4,800 ; $ 25,000

b- $ 5,600; $ 33,000 d- $ 5,900 ; $ 19,000

17- The Huffer Manufacturing Company manufacture rubber rafts. For the month of January, it incurred the following costs:

Materials …….. $ 10,000 (80% for direct materials)

Labor……..5,000 (70% for direct labor)

Factory overhead…..5,000 (for heat, light, and power)

In addition to the costs of production, the company incurred selling expenses of $7,500 and general administrative expenses of $ 8,500

Required: compute the cost of goods manufactured and the total costs.

18- The following information relates to the comfy water Bed Manufacturing Company: At the beginning of the period, there was $50,000 in work-in-process inventory. During the year Comfy incurred costs of $ 17,200 for direct materials, $15,700 for direct labor, and $32,100 for factory overhead (heat, light, and power).At the end of the period, there was work-in-process inventory of $ 40,000.

Required: compute the cost of goods manufactured for the comfy water Bed Manufacturing Company.

19- In September 2018, the BB Gun Company put into process $60,000 of raw materials (all direct materials). Department A used 15,000 direct labor hours at a total cost of $40,000, and Department B used 10,500 direct labor hours at a cost of $6 per hour. Factory overhead is applied in Department A and B at a rate of $ 3.75 and $4.50 per direct labor hour, respectively. Inventories on September1 were the following: materials, $20,000; work-in-process $28,200; finished goods, $15,100. On September 30, the inventories were: materials, $18,725; work-in-process, $24,500; finished goods, $16,500. The company produced 30,000 units during the month.

Required: Prepare a combined statement of cost of goods manufactured and sold.

20- The Avocado Company had the following information available on May31, 2017: raw materials put into process (all direct materials), $47,000; direct labor paid at a rate of $4.35 an hour in Department S, $3.75 in department T, and $5.00 in Department P. Department S worked 9,725 hours, Department T worked 11,000 hours, and Department P worked 15,475 hours. Factory overhead was $60,000 for all three departments combined.

INVENTORIES

	MAY I	**MAY31**
Raw materials	$ 14,000	$12,750
Work-in-process	16,250	18,500
Finished goods	22,000	20,000

Required:

a. Prepare a statement of cost of goods manufactured.

b. What is the amount of the cost of goods sold?

21- The Star Company purchased materials for cash at a cost of $12,795. Direct materials of $9,250 and indirect materials of $3,545 were placed into the production of the company's most popular product, 78XT. The total payroll cost was $37,000, of which $25,000 was allocated to direct labor and $12,000 to indirect labor. The payroll was paid on March3. The insurances and depreciation expenses for the manufacturing operations amounted to $16,000. Assume that the exact amount in the Factory Overhead account was applied to worked-in-process Inventory. The cost of the goods manufactory for the period was $64,000. Sales of 78XT amounted $65,000 in cash, and the cost of goods sold was $ 60,000.

Required: compute the amount by which ending work in-process inventory exceeded beginning work-in process inventory.

22- The Blimp Manufacturing Company produced 100,000 units during the year ended December31, 2018. It incurred the following costs for the year:

Materials (10% is indirect materials) $73,000

Labor (7% is indirect labor)……..... $ 97,000

Factory overhead……..125% of direct labor cost

Work-in-process inventory, January 1, 2018.....$35,250

Work-in-process inventory, December31, 2018….. $27,000

The factory overhead percentage includes indirect materials and indirect labor.

Required: Prepare a cost of goods manufactured statement for the period.

23- The following data relate to the operations of Dexter Company for 2017:

	Work-in- process	Finished goods
Beginning inventories	$44,000	$30,000
Ending inventories	35,000	22,000

The cost of goods manufactured was $ 400,000 and the gross profit for the year was $ 60,000

Required: compute the sales for 2017.

24- The Blum Company provides the following data for 2017:

	2016	2017
Inventory Balances		
Raw materials*	$12,000	13,500
Work-in-process	15,100	17,600
Finished goods	19,500	21,200

Operating Data

Cost of goods manufactured	$ 151,700
Direct labor cost	50,000
Factory overhead (utilities only)	62,500
Indirect materials cost	5,000

*consisting of both direct and indirect materials.

Required: compute the direct materials cost for 2017.

25- On December 31, year 1, the following information was available for the Tweedle Company: materials used during the year amounted to $94,000 of which $30,000 was for indirect materials labor cost for the company included to $22,000 for direct labor and $18,000 for indirect labor. The combined cost of heat and electricity was $34,000 selling, general and administrative expenses were $16,000 inventories were as follows: beginning work in-process, $9,500; ending work-in-process, $12,000; beginning finished goods, $18,000; ending finished goods, $22,000 there was no beginning or ending materials inventory.

Required: determine the total operating cost for the Tweedle Company, assuming that a periodic cost accumulation system is followed.

26- XYZ Corporation, which follows a periodic cost accumulation system, had the following information available for a period:

Inventories:

Beginning:	
Work-in-process	$5,000
Finished goods	18,000
Ending:	
Work-in-process	6,000
Finished goods	25,000
Material costs:	
Direct	75,000
Indirect	30,000
Labor costs:	
Direct	22,000
Indirect	20,000
Other factory overhead:	
Electricity	45,000
Selling, general, and administrative expenses	16,000

Required: Compute the total costs, assuming no beginning or ending materials inventory.

27- The Parrish Fertilizer Company produces various types of fertilizer. No beginning units in process or finished units were on hand on January 1, 2017; 30,000 finished units were on hand on December 31, 2017, and 95,000 units were sold during the year. There were no units in work-in-process inventory on December 31, 2017. The materials put into production cost $300,000; 75% were direct materials. There was no beginning or ending materials inventory. Labor costs were $350,000; 40% was for indirect labor. Factory overhead costs, other than indirect materials and indirect labor, were the following:

Heat, light and power $115,000

Depreciation..... 78,000

Property taxes……..65,000

Repairs and maintenance…...42,000

Selling expenses were $80,000; general and administrative expenses were $50,000.

Required: Compute the following:

a. Cost of goods manufactured
b. Total cost
c. Unit cost
d. Prime costs
e. Conversion costs
f. Period costs

28- The Blackwell Clock Company manufacturing many types of clocks. They have just completed production for the current year. The sales for the year were $945.000 and inventories were as follows:

	Ending	Beginning
Raw materials inventory	-0-	-0-
Work-in-process inventory	$60000	$75000
Finished goods inventory	54000	35000

Direct materials for the period cost $176,000, direct cost $250,000, and factory overhead cost $237,500. Selling expenses were $55,000 and general and administrative expenses were $117,000.

Required:

a- Prepare The Following Statements :
   1- Cost of goods Manufactured
   2- Cost of goods Sold

b- Compute the net income or loss.

29- The stiff shirt company has just completed its third year of operation. Sales for year were $1,300,000, and inventories were as follows:

	December 31	January 1
Raw materials inventory	-0-	-0-
Work-in-process inventory	$100,000	$95,000
Finished goods inventory	64,000	76,000

Costs For the period were as follows:

Direct materials $365,000

Direct labor.....405,000

Factory Overhead.....445,500

Selling expenses were $26,000. General administrative expenses were $82,000.

Required:

a- Prepare The Following Statements :

1- Cost of goods manufactured

2- Cost of goods sold

b- Compute the net income or loss.

Chapter Three:

Costing of Materials

Chapter three: Costing of Materials

Introduction:

Manufacturing is the process by which raw materials are converted into a finished product. Raw materials constitute an essential cost element of production. After raw materials are purchased and temporarily placed in a storeroom, a manufacturer proceeds to transform them into finished products via the incurrence of conversion costs (direct labor and factory overhead). This chapter will explore the costing and controls of materials.

Materials

Materials are the basic ingredients that are transformed into finished goods through the use of labor and factory overhead in the production process. ***Materials costs*** can be either *direct materials* (are those that can be identified with the production of a finished product, that can be easily traced to the production, and that represent a major cost of a finished product), or *indirect materials (*comprise all other materials or supplies involved in the production of a product that are not classified as direct materials). For example, the steel used in manufacturing a car is a direct materials cost, while the glue used in manufacturing furniture is an indirect materials cost.

Accounting for Materials

Accounting for materials by a manufacturer usually involves two activities the purchase of materials and their issuance.

Purchase of Materials

Most manufacturers have a purchasing department whose function is to order raw materials and supplies needed for production. The manager of the purchasing department is responsible for assuring that the items ordered meet the quality standards set by the company, are acquired at the lowest price, and are delivered on a timely basis. Three from are commonly used in purchasing goods: a purchase requisition, a purchase order, and a receiving report.

Purchase Requisition: A purchase requisition is a written request, usually sent to inform the purchasing department of a need for a materials or supplies. Suppose that on April 1 a materials storeroom clerk wishes to place an order for 20 widgets, catalog number 92, at an estimated unit price of $1.00, needed by May 1. The clerk would fill out a purchase requisition form and sent it to the purchasing department so that they can order the widgets.

Although a purchase requisition is usually preprinted according to the specification of a particular company, most forms include the requisition (serially numbered), name of department or individual making the request, quantity of items requested, identifying catalog number, description of the item, unit price, total price, shipping, handling, insurance and related costs, total cost of entire requisition, order date, required delivery date, and authorized signature.

Purchase Order: If the purchase requisition is properly completed, the purchasing department will issue a purchase order (in this case, for 20 widgets). *A purchase order* is a written request to a supplier for specified good at an agreed-upon price. The request also stipulates terms of delivery and terms of payment. The purchase order is the supplier's authorization to deliver goods and submit a bill. All items purchased by a company should be accompanied by purchase orders, which are serially numbered to provide control over their issuance. The following items are commonly included in a purchase order: preprinted name and address of company placing the order, purchase order number, name and address of supplier, order date delivery is requested, delivery and payment terms, quantity of items ordered, catalog number, description, unit and total price, shipping, handling, insurance and related costs, total cost of entire order, and authorized signature.

Receiving Report: when the goods that were ordered are delivered, the receiving department will unpack and count them. (It is interesting to note that the quantity ordered is not shown on the copy of the purchase order sent to the receiving department. This deliberate omission ensures that the goods delivered are actually counted.) The goods are checked to be sure that they are not damaged and that they meet the specifications of the purchase order and the packing slip (a list, prepared by the supplier that accompanies the order and details what is in the shipment). Next, the receiving department issues a receiving report. This form includes the supplier's name, purchase order number, date delivery was received, quantity received, description of goods, differences from the purchase order (or mention of damaged goods) and authorized signature.

Issuance of Materials

The person in charge of the storeroom is responsible for the proper storage, protection, and issuance of all materials placed in his or her safekeeping. The issuance must be authorized by means of a materials requisition form prepared by the production manager or department supervisor. Each materials requisition form shows the job number or department requesting the goods, their quantity and description, and the unit cost and total cost of the goods issued.

The cost that is entered on the materials requisition form is the amount charged to production for materials consumed. Computing the total cost of materials issued seems relatively simple: The unit cost of an item is multiplied by the quantity purchased. The quantity is readily determined from the materials requisition form; however, determining the unit cost of materials issued is not that simple during periods of inflation (rising prices) or deflation (declining prices).

During a period of changing prices, what price should be used for materials placed into production during the period and what price should be used for the materials still on hand at the end of a period (ending materials inventory)? Should the cost of materials issued be multiplied by the beginning unit price of materials, the average unit price for the period, or the ending unit price?

Systems of Accounting for Materials Issued to Production and Ending Materials Inventory

Either the periodic inventory system or the perpetual inventory system may be used to account for materials issued to production and ending materials inventory.

Accounting by the Periodic Inventory System

Under a periodic inventory system, the purchase of materials is recorded in an account entitled "Purchases of Raw Materials." If a beginning materials inventory exists, it is recorded in a separate account entitled "Materials Inventory-Beginning." Purchases plus beginning inventory equal materials available for use during a period. To arrive at the ending materials inventory, a physical count must be made of the materials still on hand at the end of the period. The cost of materials for the period is determined by subtracting the ending materials inventory from the materials available for use during the period, as follows:

Materials inventory-beginning	X
+ Purchases	X
= Materials available for use	X
- Materials inventory-ending (based on a physical count)	(X)
= Cost of Materials issued	X

Note that under this method the cost of materials issued is not directly determined; it is indirectly computed as a residual. In other words, the cost of materials issued equals what is left over after the cost of the ending inventory is subtracted from the cost of the materials available for use.

Accounting by the perpetual Inventory System

Under the perpetual inventory system, the purchase of materials is recorded in an account labeled "Materials Inventory," rather than in a purchase account. If beginning materials inventory exists, it would also be recorded as a debit in the Materials Inventory account. When materials are issued, the Materials Inventory account is credited for the cost of materials issued with a corresponding debit to work-in-process inventory account. The end result is that the cost of materials issued is charged to production at the time when the materials are issued, and the balance in the Materials Inventory account shows the cost of materials still available for use. Thus, under the perpetual inventory method, both the cost of materials issued and the ending materials inventory can be directly ascertained after each transaction.

Subsidiary ledger record cards must be maintained when a perpetual inventory system is used to account for materials inventory. The total of the materials subsidiary ledger record cards must equal the amount in the Materials Inventory Control account in the general ledger. The materials subsidiary ledger has a separate inventory record card for each type of item in inventory. The typical form of an inventory record card shows the date, quantity and dollar amount of materials received (debit) and issued (credit), and the resulting balance (debit).

The use of the perpetual inventory method also requires the taking of a physical count of materials on hand at least once a year in order to check for possible error or shrinkage due to theft or spoilage. If a physical count disagrees with the balances in the inventory record cards, the book figures are adjusted upward or downward to reflect the actual count.

Journalizing Materials Cost

The perpetual inventory system will be followed in this book since it is used by most medium and large size manufacturers; it provides better control and more information than a periodic inventory system. With the availability of inexpensive micro or mini computers even small-size manufacturers are now taking advantage of the benefits of a perpetual inventory system.

Under a perpetual inventory system, when materials are purchased, a debit is made directly to the Materials Inventory account. When direct materials are put into production, a journal entry must be made to charge the cost or materials to work-in-process inventory. The cost of indirect materials, when put into production, is debited to factory overhead control.

For example, assume 100 units of direct materials and 20 units of indirect materials are purchased for $5 per unit and $1 per unit, respectively. The following entry is made to record the purchase of materials:

Materials inventory	520	
Cash (or accounts payable)		520

100 units × $5 per unit = $500
20 units × $1 per unit = 20
Total per unit = $520

A separate inventory account for direct materials and one for indirect materials may be maintained if desired by management.

Assume next that 30 units of direct materials and 10 units of indirect materials from the above purchase are placed into production. The following entry is made to record the issuance of materials from inventory:

Work in process inventory (30 units × $ 5)	150	
Factory overhead control (10 units × $ 1)	10	
Materials inventory		160

Direct materials are debited to work in-process inventory because they represent a major element of a product's cost and therefore require separate recognition in order to provide better control. **Indirect materials** usually represent insignificant amounts, and/or are not directly traceable to a product, and are therefore charge to factory overhead control. The factory overhead control account is used to accumulate the indirect costs of production such as indirect materials, indirect labor, factory depreciation, etc.

❖ Control Procedures

It is most important that a company have a good system of materials inventory control. Achievement of good control keeps costs at a minimum level and plant production on a smooth, uninterrupted schedule. The following concepts should be employed in an inventory-control system:

1. Inventory is the result of purchasing raw materials and parts. It is also the result of applying labor and factory overhead to the raw materials to produce finished goods.
2. Reduction of inventory is the result of normal use and either finding alternative uses for or scrapping unneeded items.
3. Optimum inventory investment is based on quantitative techniques which are designed to minimize the cost of carrying inventory and the cost of ordering inventory.
4. Efficient purchasing, management, and investment in materials depend on an accurate forecast of sales and resulting production schedules.
5. Forecasts help determine when to order materials. Controlling inventory is accomplished through scheduling production.
6. Inventory control is more than maintaining inventory records. Control is exercised by people who are making personal judgments partially on the basis of their past experiences. Their decisions are made within a general framework of organizational objectives and policies to achieve them. Control is relative, not absolute.
7. Methods of inventory control will vary depending for the most part on the cost of the materials and their importance to the manufacturing process. Expensive materials, or those essential to production, will tend to have their program for control reviewed more frequently despite the cost and effort of doing so by experience personal.

Periodic and Perpetual Inventory Systems under Fluctuating Prices

1. Periodic Inventory Systems

The methods commonly used to determine the value of ending inventory and cost of materials issued under the periodic inventory system are described below.

A. Specific Identification

Specific identification is the simplest but also the most time consuming method of determining cost of materials used and cost of the ending inventory.

This method entails keeping a record of the purchase price of each specific unit and the quantity of specific units used. Cost of materials used is computed by multiplying the quantity used by the specific price of each material. In many cases, when materials are purchased, a tag showing the purchase price is attached in order to identify the item.

The information in Tables 1 and 2 is the basis for the following discussion of methods of costing materials.

Tables (1) materials purchased and used

	Date	Units Purchased	Cost Per Unit	Units used	Balance of units available
Beginning inventory	1/1	20	$10	-	20
	5/1	50	11	-	70
	6/1	-	-	30	40
	9/1	40	12	-	80
	15/1	20	13	-	100
	20/1	-	-	60	40
	28/1	10	15	-	50
Total		140		90	

Table (2) Materials available for Use:

	Date	Units Purchased ×	Cost Per Unit	= Total
Beginning inventory	1/1	20	$10	$200
	5/1	50	11	550
	9/1	40	12	480
	15/1	20	13	260
	28/1	10	15	150
Cost of materials available for use				$1,640

For the specific identification method, assume that the 30 units issued on January 6 were taken from the purchased on January 5, and the 60 units issued on January 20 were taken from both the beginning inventory (20 units) and the lot purchased on January 9 (40 units). The computation of the ending materials inventory under the ***specific identification method*** would be as follows:

	Purchase Date	**Units Purchased**	**Units Issued from Lot**	**AMT On Hand**	**× Unit Cost**	**= Ending Inventory**
Beg. Inv.	1/1	20	20	0	-	$ 0
	5/1	50	30	20	$11	200
	9/1	40	40	0	-	0
	15/1	20	0	20	13	260
	28/1	10	0	10	15	150
Total						**$ 630**

Therefore, the ending materials inventory is $630. The cost of materials issued is computed as follows:

Cost of materials available for use (Table 2)	$1,640
Less: Ending materials inventory	630
Cost of materials issued	$1,010

The specific identification method is used when dealing with expensive materials which are unique, such as diamonds; it would not be economically feasible to use this method to keep track of inexpensive materials. For example, a peanut processing company would not attach a price tag to each pound of peanuts purchased. Therefore, other methods must be employed when dealing with quantities of less expensive materials.

B. Average Cost

When an inventory contains many small, homogeneous materials (like peanuts), it is a fair assumption that the materials issued and on hand are likely to be a mixture of the materials available for use. Consider a product like gasoline. When new supplies are added to the pumps, the new liquid will mix together with the existing gasoline, leaving no clear distinction between the purchases. There are two methods of computing average cost:

i. Simple Average

Under this method, the various purchase prices are added together and their sum is divided by the total number of purchases (beginning inventory is treated as a purchase) to arrive at the average cost per unit. The simple average price for our example is computed as follows:

	Date	**Cost Per Unit**
Beginning inventory	1/1	$10
	5/1	11
	9/1	12
	15/1	13
	28/1	15
		$ 61
Simple average = $61÷5 = $12.20		

Therefore, the simple average is $12.20. Ending materials inventory is computed by multiplying the number of units on hand at the end of the period by the simple average:

Ending materials inventory = 50 × $12.20 = $610

However, if one were to compute the cost of materials issued in the same manner, the following error would result:

Cost of materials issued (90×$12.20)	$ 1,098
Plus the ending materials inventory	610
Cost of materials available for use	$1,708

The computed cost of materials available for use would be $68 greater than the actual cost of material available for use:

Actual cost of materials available for use (Table 2)	$1,640
Computed cost of materials available for use	1,708
Difference	$ 68

The difference arises because a different quantity was purchased at each price. For example, on January 5, 50 units were purchased at $11 per unit; and on January 15, 20 units were purchased at $13 per unit. Thus, the simple average method only works when the same number of units is purchased at each price. When materials are purchased in varying quantities, an alternative method of computing the average unit cost must be used.

ii. Weighted Average

A weighted average is obtained by first multiplying each purchase price by the quantity of units in each purchase. The sum of the results is then divided by the total number of units available for use.

The weighted average price for our example is computed as follows:

	Purchase Date	**Units Purchased**	**× Cost Per Unit**	**= Total**
Beg. inventory	1/1	20	$10	$200
	5/1	20	11	550
	9/1	40	12	480
	15/1	20	13	260
	28/1	10	15	150
Total		140		$1,640

Note that the total ($1,640) will always be the same figure as materials available for use.

Weighted average = $1,640 ÷ 140 = $11.71 (rounded off)

The ending materials inventory is computed by multiplying the number of units on hand at the end of the period by the weighted average cost per unit:

Ending materials inventory = 50 x $11,71 = $586 (rounded off)

The cost of materials issued may be computed in the same manner:

Cost of materials issued = 90 × $11,71 = $1.054 (rounded off)

Note that under the weighted average method, the ending inventory plus the cost of materials issued will equal the cost of materials available for use:

Ending inventory	$ 586
Cost of materials issued	1,054
Cost of materials available for use	$ 1,640

C. First-In, First-Out

In many situations, the materials that are received first are issued first. This especially true when perishable items are involved. For example, in a milk processing plant, the manager would want to sell the oldest milk first. The FIFO (initial letters of first-in, first out) method of inventory costing is based on the basis that first goods purchased are the first to be issued. Using the FIFO method, the ending inventory would consist of materials received last, and prices would therefore closely reflect current costs. The FIFO method of inventory computation for our example is as follows: The 90 units issued are assumed to be from the following purchases:

	Purchase Date	Units Purchased ×	Cost Per Unit	= Total
Beginning inventory	1/1	20	$10	$200
	5/1	50	11	550
	9/1	20	12	240
Cost of Materials Issued				$990

The 50 units in ending inventory are computed from the last purchase date back:

Purchase Date	Units Purchased	× Cost Per Unit	= Total
1/1	10	$15	$150
5/1	20	13	260
9/1	20	12	240
Ending inventory			$650

Note that both the cost of materials issued and the ending materials inventory will include part of the January 9 purchase of 40 units. Another way of looking at it is as follows:

Purchase Date	Units Purchased	
1/1	20	
5/1	50	Cost of materials issued
9/1	40	(90 units)
15/1	20	Ending materials inventory
28/1	10	(50 units)

To compute the cost of materials issued, work from the beginning materials inventory or earliest purchase and go forward in time. To compute the ending materials inventory, work from the most current purchase and go back in time.

D. Last-In, First-Out

The LIFO (first letters of last-in, first-out) method of inventory pricing assumes that the materials received last are the first to be issued. Therefore, the ending inventory reflects the process of the earliest materials received. Advocates of this method point out that it follows a flow of costs and provides a better matching of current costs with current revenue than does FIFO. **Under LIFO**, the cost of materials issued closely reflects current costs (during inflation); thus, the income determination should be more accurate because current costs are matched with current revenue. In some cases, this method may also adhere to the flow of materials concept. For example, when coal is poured down a chute into a bin, the last coal in will be the first coal out. However, this is exception and not the rule.

The LIFO method of computing inventory cost is the opposite of computing costs under FIFO. The cost of materials issued is computed by taking the last purchase first and working backward. The ending materials inventory is computed by starting from the beginning materials inventory or earliest purchase and working forward.

The LIFO method of inventory computation for our example is as follows: The 90 units issued are assumed to be from the following purchases.

Purchase Date	Units Purchased	× Cost Per Unit	= Total
28/1	10	$15	$150
15/1	20	13	260
9/1	40	12	480
5/1	20	11	220
Cost of materials issued			$1,110

The 50 units in the ending inventory are computed from the earliest purchase price going forward:

Purchase Date	Units Purchased	× Cost Per Unit	= Total
1/1	20	$10	$200
5/1	30	11	330
Ending materials inventory			$530

Note this time that both the cost of material issued and the ending materials inventory include part of the purchase on January 5 of 50 units. Another way of looking at it is as follows:

Purchase Date	Units Purchased	
1/1	20	
5/1	50	Ending materials inventory (50
9/1	40	units)
15/1	20	Cost of materials issued
28/1	10	(90 units)

The major shortcoming of the periodic inventory method is that the cost of materials issued cannot be determined without a physical count of the ending materials inventory, which can be very expensive and time-consuming. The periodic inventory techniques discussed would also be inadequate if information were continuously needed about the cost of materials issued and on hand. Because most sizable manufacturing companies need cost information continuously, they are likely to use a perpetual inventory system.

2. Perpetual Inventory System

The use of the perpetual inventory system under fluctuating prices will now be illustrated.

A. Specific Identification:

The cost of materials issued and the ending materials inventory are computed by multiplying the units issued or on hand by the specific cost of each unit issued or still on hand; therefore, the choice of either the perpetual or periodic inventory system will not affect the method of measurement.

B. Average Cost:

i. Simple Average:

Under the periodic inventory method, all the different purchase costs are added together at the end of each of period. This sum is divided by the total number of purchases (beginning inventory is treated like a purchase) to arrive at the simple average cost per unit. When the perpetual inventory system is used, this computation must be performed after each purchase; this technique is usually referred to as the "simple moving average." Hence, many averages may be used in one period.

The same example used to illustrate the periodic inventory system will demonstrate the perpetual inventory system. The simple moving average cost for the cost of materials issued and the ending materials inventory is computed as in Table 3.

Note: As recognized under the periodic inventory system, the actual cost of materials available for use ($1,640) will differ from the computed amount under the perpetual inventory system (the exception being when an equal number of units are purchased at each price). In all other instances, this problem is overcome by employing the weighted average cost method.

Table 3 Simple Moving Average: Perpetual Inventory System:

DATE	Purchased		Cost of materials available for use	Issued		Cost of materials issued	Balance		Total cost
	Units	Unit cost		Units	Unit cost		Units	Unit cost	
Beg. Inv.									$200.00
1/1			$200				20	$10,00	
5/1	50	$11	550				70	10,50 (1)	735.00
6/1				30	$10.50	$315,00	40	10,50	420.00
9/1	40	12	480				80	11,00 (2)	880.00
15/1	20	13	260				100	11,50 (3)	1,1150.00
20/1				60	11.50	690,00	40	11,50	460.00
28/1	10	15	150				50	12,20 (4)	610.00
Total			$1,640	Total		$1,005.00	ending balance		$610.00

Cost of materials issued..... $1,005.00

Ending inventory.....…..... 610,00

Computed cost of materials available for use…… $1,615. 00

COMPUTATIONS

(1)	1/1	$10,00		(2)	9/1	$21.00	
	5/1	11.00				12.00	
		$21.00	÷ 2= $10.20			$33.00	÷3 = $11.00
(3)	15/1	$33.00		(4)	28/1	$46.0	
		13.00				15.00	
		$46.00	÷4=$11.50			$61.00	÷5 = $12.20

ii. **Weighted Average**:

When the perpetual inventory system is used, the weighted average must be recomputed after each purchase instead of at the end of the period as in the periodic inventory system. The weighted average cost is computed after each purchase by dividing the total cost of materials on hand by the total number of units on hand. Under the perpetual inventory system, this technique is usually referred to as the "weighted moving average cost". The weighted moving average cost for the cost of materials issued and the ending materials inventory is computed as in Table 4.

Table (4) Weighted Moving Average: Perpetual Inventory System

Date	Purchased		Cost of materials available for use	Issued		Cost of materials issued	Balance		Total cost
	Units	Unit cost		Units	Unit cost		Units	Unit cost	
Beg. Inv. 1/1			$200				20	$10,00	$200.00
5/1	50	$11	550				70	10,714(1)	750.00
6/1				30	$10.714	$321.42	40	10,714	428.00
9/1	40	12	480				80	11,357(2)	908.65
15/1	20	13	260				100	11,686(3)	1,168.60
20/1				60	11.686	701.16	40	11,686	467.44
28/1	10	15	150				50	12,349(4)	617.45
Total			**$1,640**	**Total**		**$1,022.58**	**Ending balance**		**$617.45**

Cost of materials issued	$1,023
Ending materials inventory	617
Computed cost of materials available for use	$1,640

COMPUTATIONS

(1)	20	at	$10,00	=$200.00	(2)	40	at	$21.00	$428.56
	50	at	11.00	=$550.00		40	at	12.00	$480.00
	70			$750.00		80		$33.00	$908.56
	Average		$10.714	$908.56		**Average**		$11.357	
(3)	80	at	$11.357	$260.00	(4)	40	at	$11.686	=$467.44
	20	at	13.00	=260.00		10	at	15.00	= 150.00
	100			$1,168.56		50			$617.44
	Average		$11.686			**Average**		$12.349	

C. **FIFO**. Since the cost of materials issued is computed from the earliest materials purchased, and the ending materials inventory consists of the most recent purchases, these two amounts will be identical under both the periodic and the perpetual inventory systems.

D. **LIFO.** Here, the cost materials issued and the ending materials inventory may differ under the periodic and perpetual inventory systems. The difference results from the cost to be assigned at the date that materials are issued. Under the perpetual inventory system, a cost must be assigned to each unit issued on the date of issue, whereas under the periodic inventory system, the cost is assigned at the end of the period.

Under the LIFO perpetual cost inventory system, the cost of materials issued and the ending materials inventory are computed as in Table 5.

Table (5) LIFO: Perpetual Inventory System

DATE	Purchased		Cost of materials available for use	Issued		Cost of materials issued	Balance		Total cost
	Units	Unit cost		Units	Unit cost		Units	Unit cost	
1/1			$200				20	$10,00	$200.00
5/1	50	$11	550				20	10,00	750.00
							50	11,00	
6/1				30	11.00	$330.00	20	10,00	
							20	11,00	420.00
9/1	40	12	480				20	10,00	
							20	11,00	900.00
							40	12,00	
15/1	20	13	260				20	10,00	
							20	11,00	1,640.00
							40	12,00	
							20	13,00	
20/1				20	13.00		20	10,00	
				40	12.00		20	11,00	420
28/1	10	15	150				20	10,00	
							20	11,00	570.00
							10	15.00	
Total			**$1,640**	**Total**		**$1,070.00**	**Ending balance**		**570.00**

Cost of materials issued..... $1,070

Ending inventory.....…..... 570

Cost of materials available for use……. $1,640

Comparison of Inventory Methods:

The method selected for valuing the ending materials inventory directly affects the allocation of the materials available for use between the cost of materials issued and the ending materials inventory. Table 6 is a summary of the results of using the different methods and inventory systems in our example.

The largest gross profit results from computing inventory under the FIFO method, while the lowest gross profit results when the LIFO method is used. The FIFO method results in the highest ending materials inventory (assuming inflation); the LIFO method results in the lowest ending materials inventory. The difference between the gross profits obtained under FIFO versus LIFO would be exactly equal to the difference between the two ending materials inventories and cost of materials issued.

In periods of rising prices, if a firm wishes to show a lower gross profit and therefore lower net income, it would use the LIFO method. Imagine the amount of manipulation and confusion that would result if a firm were free to choose a different method inventory valuation each period. To prevent this occurrence, generally accepted accounting principles state that once a method of valuing inventory has been selected, the same method must be used every year.
This conforms to a fundamental accounting concept: consistency.

Table 6 Summary and Comparison of Inventory methods:

	Specific Identification	Weighted Average	FIFO	LIFO
Cost of materials issued:				
Periodic inventory system	$1,010	$1,054	$990	$1,110
Perpetual inventory system	1,010	1,023	990	1,070
Ending inventory:				
Periodic inventory system	630	586	650	530
Perpetual inventory system	630	617	650	570

After an acceptable has been chosen, it must be used consistently, unless it is evident that changing to another method will improve the company's financial reporting. The initial selection of a method should be based on which one results in the best approximation of periodic net income for a company. Since no two companies are identical, a firm's particular situation must be analyzed before the most appropriate valuation method can be selected.

Lower of Cost or Market (LCM)

Once an inventory method has been selected and used the next step to consider is whether the "lower-of-cost-or-market" rule applies .This rule states that ending materials inventory must be assigned either the historical cost (cost that the company paid and originally recorded on the books) or the current market value, whichever is lower. Current market value is defined as the replacement cost of an item, or how much it would cost the firm today to buy an item of inventory.

If replacement cost is higher than historical cost, no adjustment is necessary. However, if replacement cost is lower than historical cost, the ending materials inventory must be reduced and the cost of goods manufactured increased. Logically it follows that if raw materials in inventory decreases in value, the selling price of the finished goods should also decrease; thus, an eventual loss of wealth will occur. The loss in wealth should be charged to the period in which the loss occurred. The LCM rule is supported by the principle of conservatism, which states that all potential losses should be accounted for in the period in which they occur.

Computation of LCM

The LCM rule may be applied to the total materials inventory figure or individually to various units of inventory. The method selected must be consistently applied.

The previous examples of inventory valuation assumed (for the sake of simplicity) that we had only one type of materials inventory. In a situation where only one type of inventory exists and where the replacement cost is lower than the actual unit cost, the replacement cost must be used instead of the actual cost. **For example**, refer back to our computation of materials inventory under LIFO using the periodic system. The following dollar amount of ending materials inventory resulted for the 50 units:

Purchase Date	Units Purchased	× Cost Per Unit	= Total
1/1	20	$10	$200
5/1	30	11	330
Ending materials inventory			**$530**

No adjustment would necessary if the replacement cost were greater than or equal to $11 per unit. However, assume that the replacement cost dropped to $8 per unit. Now the ending materials inventory would be computed as follows: 50 units x $8= $400

Materials inventory before LCM adjustment……$530

Materials inventory after LCM adjustment…….. 400

Difference (to cost of goods manufactured)……..... $130

The resulting decrease of $130 in ending materials inventory would be added to the cost of goods manufactured because it represents a loss in inventory value.

Criticism of the LCM rule:

The LCM rule was introduced in a period when was considered to be extremely important. The LCM rule violates consistency, because in one period the ending materials inventory may be valued at cost, but in another period it is based on market value. It is also inconsistent to recognize a loss in inventory value before it is actually realized, although increases in replacement cost are recognized only when the finished inventory is sold.

Defense of the LCM rule:

The AICPA has established limits on the market value used to compare with cost.

1- That market value may not exceed the net realizable value (defined as selling price less any cost to complete and sell). This upper limit precludes deferring losses into future periods by overvaluing ending inventories.

2- That market value may not be less than net realizable value minus a normal profit margin. This lower limit precludes the deferral of profits into future periods by undervaluing ending inventories.

Summary Problem

The president of Margo's Supply Company has following data concerning the company's wood pulp inventory for the month of January. The company measures its ending inventory under FiFO method.

1/1	Opening inventory : 1000Ib of wood pulp costing $ 0.50
10/1	Purchased: 300 Ib at $ 0.55/Ib
16/1	Issued: 300 Ib
26/1	Issued: 750 Ib
28/1	Purchased: 400 Ib at $ 0.60/Ib
31/1	Issued: 350 Ib

All purchases are made by paying cash

Required:

a- Journalize the above transactions under a perpetual inventory system

b- Compute the cost of materials issued and the ending materials inventory.

Solution

(a)

January 10	Materials inventory (300 × $0.55)	165.00	
	Cash		165.00
	To record purchase of goods on 1/10		
January 16	Work-in-process inventory	150.00	
	Materials inventory (300 × $.50)		150.00
	To record cost of materials issued.		
January 26	Work-in-process inventory	377.50	
	Materials inventory		377.50
	[(700 × $.50) + (50 × $.55)		
	To record cost of materials issued.		
January 28	Materials inventory (400 x $.60)	240.00	
	Cash		240.00
	To record cost of materials issued.		
January31	Work-in-process inventory	197.50	
	Materials inventory		197.50
	{(250 x $.55) ÷ (100 x $.60)}		
	To record cost of materials issued.		

(b)

Materials inventory				Work-in-process inventory	
1/1	500.00	16/1	150.00	16/1	150.00
10/1	165.00	26/1	277.50	26/1	377.50
28/1	240.00	31/1	197.50	31/1	197.50
	905.00		725.00		725.00
	180.00				

Cost of materials issued ……..…. $725

Ending materials inventory……..……. 180

Cost of materials available for use ……. $905

Exercises

1- A written order sent to inform the purchasing department of a need for materials is called a:

a) purchase order
b) purchase requisition
c) receiving report
d) materials requisition form

2- A written request to a supplier for specified goods at an agreed-upon price is called a:

a) purchase order
b) purchase requisition
c) materials requisition form
d) receiving report

3- Which of the following forms must be filled out when inventory is to be removed from the materials inventory to be placed into production?

a) purchase order
b) purchase requisition
c) receiving report
d) materials requisition form

4- Under a periodic inventory system, the purchase of materials is recorded in an account entitled:

a) cost of goods sold
b) purchase of raw materials
c) work in process inventory
d) materials inventory

5- Under a perpetual inventory system, the purchase of materials is recorded in an account entitled

a) cost of goods sold
b) purchase of raw materials
c) work in process inventory
d) materials inventory

6- The total of materials subsidiary ledger inventory cards must equal to the amounts in the following accounts:

a) cost of goods sold
b) purchase of raw materials
c) work in process inventory
d) materials inventory

7- The cost of idle time incurred by employees that is considered normal for the production should be charged to:

a) work in process inventory
b) direct labor
c) administrative expense
d) factory overhead

8- Jason company accounts for materials issued to production through a periodic inventory system. If Jason company had materials available for use of $3000, purchases of $16000, and an ending materials inventory (based on a physical count) of $9000, what is the cost of materials issued?

a) $37000
b) $s23000
c) $5000
d) $21000

9- The Douglas corporation uses a periodic inventory system and provided the following data:

Cost of materials used	$15000
Purchase of materials	$15000
Materials available for use	$19000

Required: compute by how much the ending materials inventory the beginning materials inventory.

10- Elko Party Hat Manufacturing Corporation was formed on September 29.2018. the president of the company provided the following data concerning the materials inventory for the month of February :

February.2 purchased for cash 1000 units of direct materials costing $20 per unit and 30 units of indirect materials costing $5 per unit.

February.5 placed into production: 400 units of direct materials.

February.20 placed into production: 10 units of indirect materials

Required: write journal entries for the above transactions.

11- The following information relating to materials inventory account was provided by Sheila Corporation. Which uses a perpetual inventory system: if you know the following

Beginning balance	$100000
Additional debits added the account during the period	$300000.
The ending balance exceeded the beginning balance by	$2000.

Required: compute the cost of materials used.

12- The beginning materials inventory and the purchases of penny company for the year are as follow:

	Units	Total cost
January 1	65	$650
February 1	70	840
March 25	85	1360
August 19	90	1620
October 6	105	2100
December 17	145	2900
	560	**$9470**

During the year 500 units were issued. The FIFO method of inventory valuation is used under periodic inventory system.

Required: determine the cost of materials issued and the cost of ending materials inventory.

13- Based on the information given in Ex.12, determine the cost of materials issued and the cost of ending materials inventory assuming that the LIFO method of inventory valuation is used under periodic inventory system.

14- The Regal Corporation manufactures and distributes various types of giftware. A schedule of opening raw materials inventory, purchase, and issuance for the current year is as follow:

	Date	**Units purchased**	**Cost per unit**	**Unit issued**
Opening Inventory	1/1	2500	$53.00	---
	2/3	3275	54.50	
	9/5	---	---	2950
	11/7	2320	57.00	
	1/9	---	---	1525
	6/10	1905	56.00	
	17/12	---	---	1150

Additional information: the Regal Corporation uses aperiodic inventory system, replacement cost of each unit on December 31 is $56

Required:

First: compute the ending materials inventory and the cost of materials issued, using the following methods:

a- Specific identification (assume that issues on May 9 came from the purchase of March : issues on September 1 came from the purchase of July 11: and issues on December 17 came from the purchase of October)

b- Simple average cost

c- Weighted average cost

d- FIFO

e- LIFO

Second: Apply the LCM rule on an individual basis.

15- The chilly air conditioner company sells one type of commercial air-conditioning unit. Each finished unit costs the company $130: the selling price per unit is $250, completely installed. The company had an opening inventory on January 1 of 130,000 units of material x. the total cost of the beginning materials inventory was $169000. During the current year, the Chilly Company made three purchases. A schedule of raw materials inventory purchase, and issuance for the current is as follow:

Date	**Units purchased**	**cost per unit**	**unit issued**
5/2	----	----	14000
3/3	17000	14.25	----
23/5	13000	15.25	----
3/6	----	----	12000
19/8	----	----	15000
2/11	12000	16	----

The chilly air conditioner company uses a perpetual inventory system, and the replacement cost for each unit of material x is $16 as of December 31.

Required: compute the ending materials inventory and the cost of materials issued, using the following methods:

a- Specific identification, given that the materials issued on February 5 came from the beginning materials inventory: June 3, from purchases of May 23: and august 19, came from the purchase of March 3.

b- weighted average cost

c- FIFO

d- LIFO

Chapter four:

Costing of Labor

Chapter Four: Costing of labor

Introduction:

Labor costs represent a significant part in the total production's costs. The term "labor costs" is excessive to include wages paid to employees working directly in production and these wages represent direct costs. The other part is the salaries and wages paid to supervisors, managerial representatives and the like, and represent indirect costs. In revising the workers earnings (wages), we will find that there are enormous number of types can be included within these earnings, such as cash wages, allowances, employer's contribution to provident fund, production bonus, profit bonus, pension, and holiday and vacation pay. As a final point, wages would be paid either according to hours or sometimes according to the amount of production.

Labor is the physical or mental effort expended in manufacturing a product. Labor cost is the price paid for using human resources. The compensation paid to employees who engage in production–related activities represents factory labor cost. Direct labors related are those who work on a product directly, either manually or by using machines. **Direct labor** was defined as all labor that is directly involved in the production of finished product, that can be easily traced to the product, and that represents a major labor cost of producing that product. **Examples** are assembly line workers in an automobile factory or knitting machine operators in a sweater factory. Direct labor is considered both a prime cost and a conversion cost.

"Direct labor cost includes the labor used to manufacture the product or to provide the service plus some portion of non-value-added time that is normal and unavoidable, such as coffee breaks and personal time. Other types of nonproductive labor that are discretionary and planned, such as downtime, payroll taxes, fringe benefits (vacation, etc.), and training usually are included not as direct labor but as indirect labor"

Indirect labor is factory labor that is not directly traceable to a product; also, it is not considered worthwhile to relate the cost of the indirect labor to production. Laborers whose services are indirectly related to production include product designers, job supervisors, and product inspectors. Indirect labor is considered part of factory overhead cost.

"Indirect labor costs include supervision, quality control, inspection, purchasing and receiving, materials handling, janitorial labor, downtime, training, and cleanup. Note that an element of labor can sometimes be both direct and indirect, depending on the cost object; for example, labor for the maintenance and repair of equipment might be direct to the manufacturing department where the equipment is located but indirect to the products manufactured in that department"

Costs Included in Labor

The principal labor cost is wages paid to production workers wages are payments made on an hourly, daily, or piecework basis. Salaries are fixed payments made regularly for managerial or clerical services However, in practice, the terms "wages" and "salaries" are often incorrectly used interchangeably.

Total labor costs have been increasing rapidly in recent years, particularly in areas such as vacation and holiday pay, pensions, hospitalization, life insurance, and other fringe benefit costs. In some cases these supplementary costs represent nearly 30% of regular earnings.

Accounting for Labor

To retain information on different categories, indirect labor costs are commonly divided into many sub classifications, for example, office staff and idle time costs. Note that managers' salaries usually are not classified as indirect labor costs. Instead, the compensation of supervisors, department heads, and all others who are regarded as management is placed in a separate classification of labor-related overhead.

Accounting for labor by a manufacturer usually involves three activities: timekeeping, computation of total payroll, and allocation of payroll costs these activities must be performed before the payroll is recorded in the accounting records.

A. Timekeeping Most large-scale manufacturers have a separate timekeeping section within a personnel department whose function is to collect the house worked by employees. Two source documents commonly used in timekeeping are the time card and the labor job ticket.

i. **A time card (clock card)** is inserted in a time clock by the employee several times each day upon arrival, going to lunch, taking a break, and when leaving for day. By mechanically keeping a record of total hours worked each day by employees, this procedure provides a reliable source for computing and recorded total payroll costs.

ii. **Labor job tickets** are prepared daily by employees for each job worked on. Labor job tickets indicate the number of hours worked, a description of work performed, and the employee's wage rate (inserted by the payroll department).

B. Computation of Total Payroll:

The payroll department's primary function is to compute the total payroll, including gross amount earned and the net amount payable to employees after deductions (for federal and state withholding taxes, social security taxes, and so on). The payroll department distributes the payroll and maintains records of employees' earning, wage rate, and job classification.

C. Allocation of Payroll Costs

Using time cards and labor job tickets as a guide, the cost accounting department must allocate the total payroll costs (including the employer's portion of taxes and fringe costs) to individual job, departments, or products. Some companies have the payroll department prepare the allocation and send it to the cost department where the appropriate journal entries are prepared. The total payroll cost for any one period must equal the sum of labor costs allocated to individual jobs, departments, or products.

Journalizing Labor Costs

Payrolls are generally prepared weekly, semimonthly, or monthly. Gross wages for an individual are determined by multiplying the hours shown on time cards by the rate per hour, plus any bonus or overtime .Journal entries to record the payroll and related liabilities for amounts withheld are made each payroll period. Employer payroll expenses and payroll cost distributions are usually journalized at the end of the month.

The basic journal entries to record factory labor costs are follows:

1- To record the payroll:

Work-in process inventory (direct labor)..... x

Factory overhead control (indirect labor)..... x

Payroll payable……..... x

2- To record employee withholding and pay the payroll:

Payroll payable……..... x

Employee withholding payable……..... x

Cash (to employees) ……..... x

*These withholdings include FICA, state and federal taxes, union dues, insurance, savings, etc.

3- To record employer taxes and fringe benefit costs (pension, insurance, etc.):

Factory overhead control……..... x

Employer taxes and benefit payable…….....x

Special Problems Relating to the Accounting for Labor

The accounting for labor involves special problems that are not encountered in the accounting for materials. The following problem areas will be discussed: Fringe benefit costs, shift premiums, overtime, idle time, and minimum guaranteed wage and incentive plans.

1- Vacation pay

Vocation pay should not be charged to work-in-process when an employee is on vacation. An employee is contributing to production only while on the job. Therefore, only payroll costs for the weeks actually worked should be included in work-in-process inventory, and vacation pay should be accrued over the same period of productive labor and charged to factory overhead control.

Factory employees are generally entitled to paid vacations after an initial period of employment. The amount of vacation time is usually based on length of employment. An employee who has worked between 1 and 5 years may get vacation, while an employee who has worked more than 5 years may be entitled to 3 weeks.

For example: an employee earning $150 per week is entitled to a 2 week paid vacation, or $300. In order to record the weekly labor cost to production, the entry should show the following:

Work-in-process inventory……..150

Factory overhead control-Vacation pay ($300/50)……...6

Payroll payable……150

Vacation pay payable……6

This entry may be made for the 50 weeks that the employee is working. When it comes time, for vacation, $300 will have accumulated in the Vacation Pay Payable account. Some companies, having hundreds or even thousands of employees, may prefer to record the vacation, pay via a separate monthly repetitive entry, based on one-twelfth of the annual estimated vacation cost.

For holiday pay, the amount of the accrual will depend on provisions of the labor contract or on company personnel policies. With the number of paid holidays usually ranging from 8 to 11 during a year. Accounting for holiday pay is handled much the same as vacation pay. In fact, many companies combine the two costs into one account, Vacation and Holiday pay, making one entry instead of two.

In an actual business these accruals arc generally based estimated annual totals. Thus, the estimated total vacation pay could be based on last year's amount adjusted for any expected changes. Since most vacations are taken during July and August, any corrections in the accrual could be spread out over the last 5 or 6 months of the year so that no costs would be unduly distorted. This same accrual procedure can be used for other paid absences, such as jury duty or sick

leave. For a salaried employee, the vacation pay, holiday pay, or other paid leave will be charged to the period in which the absence occurs. It is assumed that the work will be done by another person during the absence or that the absent employee will take care of it upon returning. If a temporary worker is hired to handle the duties, the additional labor cost is charged to factory overhead control (to avoid double counting). Payroll fringe benefit costs have increased appreciably. A growing number of companies has chosen to treat fringe benefit costs as direct labor costs. However, most companies still include the cost of fringe benefits in factory overhead accounts.

2- Shift Premiums

It is an accepted practice to pay shift premiums, or higher hourly rates, for the less desirable evening shift (3 P.M. to 11 P .M) or night is shift (I l PM. to 7 A.M.) This shift premium, or shift differential, should be changed **factory overhead control rather than work-in-process**, and spread over all units produced for example, assume-a company's day shift rate is $6.50 per hour, and the night shift rate for the same job is $7.00, or $0.50 more per hour. The following entry would be made for a production employee working 40-hour week on the night shift.

Work-in-process Inventory (40 hours xS6.50 per hour) …….260

Factory overhead control-shift premium (40hoursxS0.50 per hour)…… 20

Payroll payable (40 hours x $7.00 per hour)…….. 280

Note that charging factory overhead control for shift premiums (instead of work-in-process) is especially important when a job order cost system is used because the unit cost of individual jobs produced when shift premiums are paid will not be distorted Shift premiums are not caused by specific jobs and therefore should be spread over all the jobs produced during the period.

3- Overtime Premium

Regular earnings represent the total hour worked, including overtime hours, multiplied by the regular Pay rate. Overtime premium represents the overtime hours multiplied by the premium rate. The premium rate for overtime is usually some fraction of the regular rate. Over time is commonly referred to as time - and- a half because most overtime hours worked are paid the regular rate plus a premium of one - half the regular rate. Three accounting treatments that are commonly used are based on the underlying cause of over time

TREATMENT 1 most overtime results from the random scheduling should be treated like a shift premium and changed to factory overhead control. For example, assume that an assembler, Harry Smith, worked a total of 45 hours in a single week on job 345. Smith's weekly rate of pay is $6 per hour for any hours worked up to 36 hours as per his union contract, and $9 per hour for any hours worked in excess of 36 hours per week. Smith's total wages for the week are computed as follows:

Regular pay (45hours x$6 per hour)	$270
Overtime premium (9 hours x $3 per-hour)	27
Gross pay	$297

The journal' entry to record Smith' s total wages for the week, assuming that the overtime premium was due to random scheduling, is as follows:

Work-in-process inventory — job345	270	
Factory overhead control- overtime premium	27	
Payroll payable		297

TREATMENT 2 When overtime results from the requirements of a specific job and not from random scheduling, the overtime premium should be charged to the specific job that caused the overtime. For example, if the overtime worked by Harry smith was caused by a rush order and the customer have agreed to pay for special service, then the following entry should be made:

Work- in — process inventory —job 345	297	
Payroll payable		297

TREATMENT 3 if overtime resulted from negligence or poor workmanship on the part of Harry Smith, then the overtime premium should be charged as a loss and the following entry should be made:

Work- in process inventory — job 345	270	
Loss from overtime premium	27	
Payroll payable		297

The type of accounting treatment accorded overtime is important in that it determines what actions, if any, should be taken by management in the planning and control of labor costs. For example, the recording of a loss might call for closer supervision or better on-the job training.

4- Idle Time

Idle time results when employees have no work to perform but are still paid for their time. For example, when a new job is being "set up" for production, some workers may temporarily have nothing to do. If their idleness is normal for the production process and cannot be avoided, the cost of idle time should be charged to factory overhead control Let us assume that Karla King spent 36 hours on job 97 and was idle for 4 hours during the week. King's rate of pay is $8 per hour for a 40-hour week, as per union contract. The following entry should be made to record King's total wages:

Work- in —process inventory' —job 97(36 hours x $8/hour)….. …288

Factory overhead control idle time (3 hours x S8hour)……. ... 32

Payroll Payable……320

If the cost of idle time was due to negligence or inefficiency, it should be charged to a loss account. For example, if King was idle for 4 hours because the work station preceding hers on the assembly line was inefficient and not able to produce the quantity of units that should have been produced and transferred to king, then the following entry should be made:

Work-in-process inventory- job 97……. 288

Loss from idle time…….32

Payroll Payable…….. 320

5- Minimum Guaranteed Wage and Incentive Plans

When payments to an employee are based solely on the number of units produced, the employee is said to be paid at a "piecework" rate. Many employers will pay employees a minimum wage but they can earn more if they produce more. This labor payment system benefits new employees because it guarantees them a minimum salary while they are learning their new job (during which time they usually do not produce enough units to trigger the piecework rate). Experienced employees also benefit from this system because they are provided an opportunity to earn more money as they become more efficient. If the output multiplied by the piece rate results in an amount less than the guaranteed wage, the difference is charged to factory overhead control. If the output multiplied by the piece rate results in an amount greater than the guaranteed wage, it should theoretically be charged to work-in-process inventory. Under this type of compensation system, an average employee working on a job is expected to earn not only the minimum wage but a bonus as well. Had another type of compensation system been used, the employer would probably have paid workers an amount equivalent to the minimum wage plus the average bonus. An example of the minimum rate/piecework rate compensation system is shown in table (1). Any employee who produced more than 75 units received bonus. Factory overhead is charged $9($6+$3) because two employees did not produce enough units to exceed the minimum guaranteed wage.

Work-in-process inventory…….174

Factory overhead control- minimum guaranteed wage……..9

Payroll payable ……..183

Table (1) Combined Minimum rate & Piecework Rate, Daily summary

Employee Names	Units Produced	Price Rate	Piecework Earnings	Difference*	Total Earnings
Zaccaro	65	$0.60	$ 39	$ 6	$ 45
Frankel	75	0.60	45	…	45
Lyle	80	0.60	48	…	48
K.Mooney	70	0.60	42	3	45
Totals	**290**		**$174**	$9	**$183**

*Minimum Guaranteed Daily Wage= $ 45.00

Incentive plans vary in format and application. Two commonly used plans are the Gnatt Task and Bonus Plan and the Taylor Differential Piece-Rate System. Under the Gnatt Plan, a bonus rate is applied only to the total number of pieces produced above the standard number of units. Under the Taylor System, a bonus rate is applied to the total number of pieces produced as long as the standard is achieved.

Before adopting an incentive plan, management must examine the possible negative effects. Incentive plans require additional record-keeping, resulting in increased clerical costs. In addition, quantity may become the worker's main consideration, with the single-minded objective of extra units superseding upper-level management's objective of maximum quality. For incentive plans to be considered successful, increases in total payroll. costs must be offset by in-creases in Production and sales as well as reductions in labor cost per unit and/or labor-related overhead costs per unit.

Summary Problems

Summary Problem (1)

The A. B. Cody Company recently adopted as incentive plan. Factory workers are paid $.75 per unite with a guaranteed minimum wage of $200 per week. Following is a report on employees' productivity for the week ending May 19, 2020. All employees had worked the full 40-hour week.

Weekly Summary	
Name	**Units Produced**
M. Akoto	240
J. Halstead	275
H. Glassman	250
A. lanello	285
Rivera	225
Victor	265
Total	**1,540**

Required: Compute each employee's gross wages, what amount should be charged to work-in-process inventory and to factory overhead?

Solution:

Name	**Units produced**	**Price rate**	**Piecework earnings**	**Below minimum**	**Total earnings**
M.Akoto	240	$ 0.75	$ 180	$ 20.00	$ 200
J.Halstead	275	0.75	206.25	-	206.25
H.Glassman	250	0.75	187.50	12.50	200
A.Lanello	285	0.75	213.75	-	213.75
K.Rivera	225	0.75	168.75	31.25	200
V.Victor	265	0.75	198.75	1.25	200
Total	**1,540**		**$ 1,155**	**$ 65**	**$ 1,220**

$1,155 should be charged to work-in-process inventory and $65 should be charged to factory overhead.

Summary Problem (2)

Herman Highgear Manufacturing Corporation pays its employees weekly. Below is the payroll summary prepared by the payroll department for the week ended January 13, 19XX.

Payroll Summary			
Name	**Hours**	**Rate**	**Total Gross Pay**
J.Opoltetto	40	$ 6.50	$ 260
T.Malmgren	35	5.75	201.25
K.Keller	40	6.00	240
A.McGahan	40	6.50	260
F.Polli	36	6.25	225
J.Montalban	40	6.00	240
B.Valli	40	6.50	260
Total			**$ 1,686.28**

Additional information:

Total federal income tax withheld = $ 120

Total FICA tax withheld = $ 75

From the time cards, the following information was obtained:

Name	Total Hours	Direct hours	Indirect hours
J.Opoltetto	40	35	5
T.Malmgren	35	34	1
K.Keller	40	35	5
A.McGahan	40	30	10
F.Polli	36	30	6
J.Montalban	40	40	…
B.Valli	40	38	2
Total	271	242	29

Required: Record the payroll, employee taxes, and payment to employees.

Solution:

(a)

Work-in-process inventory ……..1,502.50

Factory overhead control……..……..183.75

Payroll payable …….1,686.25

COMPUTATIONS

	Direct Labor		Indirect Labor	
J.Opoletto	35 × $6.50=	$227.50	5× $6.50 =	$32.50
T.Malmgren	34 × 5.75 =	195.50	1× 5.75 =	5.75
K.Keller	35 × 6.00 =	210.00	5× 6.00 =	30.00
A.Mcgahan	30 × 6.50 =	195.00	10× 6.50 =	65.00
F.poli	30 × 6.25 =	187.50	6× 6.25 =	37.50
J.Montalban	40 × 6.00 =	240.00	--- ---	
B.Valli	38 × 6.50 =	247.00	2×6.50 =	13.00
Totals		**$1.502.50**		**$96.75**

(b)

Payroll payable	1,686.25	
Employee income taxes payable		120.00
Employee FICA taxes payable		75.00
Cash		1,491.25

Summary Problem (3)

The H. B. Hayes Corporation's vacation policy is as follows:

I to 2 years of service: I week paid vacation.

3 to 10 years of service: 2 weeks paid vacation.

Over 10 years: 3 weeks paid vacation.

The payroll records show the following:

NAME	YEARS OF EMPLOYMNT	SALARY (WEEKLY)
K. Abby	32	$200
B. Caron	1.5	153
S. O"Laughlin	7	300
L. Locklin	5	275
M. Macnamara	12	392
F. Stack	4	200
V. Tige	0.5	150
W. Brandy	1	153
K. Torres	5	275
T. zello	15	441
Total		**$2.539**

Required:

a-Determine the amount that should be recorded each week for each employee.

b- Assuming no employee is on vacation; give the journal entry to distribute the weekly payroll.

Solution

	VACATION				
Name	**WEEKS**	**SALARY**	**VACATION PAY ÷ WEEKS ON JOB***	**=**	**ACCRUAL**
K. Abby	2	$200	$400 ÷ 50	=	$8
B. Caron	1	153	153 ÷ 51	=	3
S.O'laughlin	2	300	600 ÷ 50	=	12
L Locklin	2	275	550 ÷ 50	=	11
M.MAcnamara	3	392	1,176 ÷ 49	=	24
F. Stack	2	200	400 ÷ 50	=	8
V. Tige	-	150			
W. Brandy	1	153	153 ÷ 51	=	3
K. Torres	2	275	550 ÷ 50	=	11
T. Zello	3	441	1,323 ÷ 49	=	27
Total					**$107**

*** 52** Weeks less Number of Vacation Weeks

(b)

Work-in-process inventory	2,539	
Factory overhead control—vacation pay	107	
Payroll payable		2,539
Vacation pay payable		107

Summary Problem (4)

The Soapy Manufacturing Company awards a year-end bonus equal to 2 weeks' salary to all employees who have been employed for at least I Year. Following are the payroll records:

NAME	YEARS OF EMPLOYMNT	SALARY (WEEKLY)
J. J. Kosinsky	3	$ 208
F. B. Frome	10	286
H. H. Healy	1/2	198
K. L. Kim	4	182
A. C. Dorfman	4	234
C.I. Chu	5	260
Total		$ 1.368

Required:

a- Compute each employee's bonus.

b- Give the journal entry to distribute the weekly payroll, including the bonus accrual. (Assume the bonus is charged to factory Overhead control.)

Solution

a)

NAME	Weekly Salary × 2	Bonus
J. J. Kosinsky	$ 208 × 2	$416
F. B. Frome	286 × 2	572
H. H. Healy	--- × 2	---
K. L. Kim	182 × 2	364
A. C. Dorfman	234 × 2	468
C.I. Chu	260 × 2	520
Total annual bonus payment		**$ 2,340**

b) Bonus accrual:

NAME	BOUNS / 52	AMOUNT
J. J. Kosinsky	$416	$8
F. B. Frome	572	11
H. H. Healy	….	---
K. L. Kim	364	7
A. C. Dorfman	468	9
C. 1. Chu	520	10
Total	**$ 2,340**	**$45**

Work-in-process inventory	1,368	
Factory overhead control—Bonus pay	45	
Payroll payable		1,368
Bonus payable		45

Exercises

1- Factory worker fringe benefit costs are usually charged to:

a- work in process inventory

b- direct labor

c- administrative expense

d- factory overhead

2- Vacation pay for factory workers should be charged to:

a- work in process inventory

b- direct labor

c- administrative expense

d- factory overhead

3- The cost of idle time incurred by employees that is considered normal for the production should be charged to:

a) work in process inventory

b) direct labor

c) administrative expense

d) factory overhead

4- Which statement is correct?

a) Vacation pay should be charged to work in process when an employee is on vacation.

b) Accounting for holiday pay is handled in much the same way as vacation pay.

c) For a salaried employee, vacation pay, holiday pay, and overtime pay should be accrued over periods of productive labor and charged to factory overhead control.

d) Because of appreciable increases in payroll fringe benefit costs, many companies have changed their treatment of these costs and now charge them to factory overhead control.

5- The lemon Car Company operates two shifts. The company's day shifts pay rate is $5 per hour and the night shift pay rats $5.5 for the same work ($0.5 more per hour). Which entry is appropriate for a night shift worker who puts in 35 hours?

a) work in process inventory 175
Work in process inventory –shift premium 17.5
Payroll payable 192.5

b) work in process inventory 192.5
Payroll payable 192.5

c) work in process inventory 175
Loss from shift premium 17.5
Payroll payable 192.5

d) work in process inventory 175
Factory overhead control –shift premium 17.5
Payroll payable 192.5

6- Idle time that results from negligence or inefficiency should:

a) Be accounted for in a manner similar to overtime premium that resulted from poor workmanship.

b) Be accounted for in the same a manner as idle that is normal (cannot be avoided).

c) be charged to administrative expense

d) Be accounted for in a manner similar to overtime premium that resulted from the requirements of a specific job.

7- Mitmakers Co. pays their employee on a combined minimum rate and piecework rate plan. The minimum guaranteed daily wage is $55. Any employee who produces more than 20 baseball mitts receives a bonus. Assume that yesterday, Mr. Fabor produced 23mitts. What amount should be charged to factory overhead control?

a) 0

b) $8.25

c) $55

d) $63.25

8- Based on the previous information .assume that Mr. Jackson produced 7 mitts. What amount should be

a) 0
b) $19.25
c) $55
d) $35.75

9- The Tom Thumb Corporation follows this vacation policy for workers:

1 to 3 year of service: 1 week paid vacation

4 to 12 year of service: 3 week paid vacation

Over 12 years of service: 4 week paid vacation

The payroll records show the following the information pertaining to the next year (all employees work directly on the product).

Name	Years of employment	Salary (weekly)
I. Gelati	5	$350
B. O'Hara	2	175
R. Reilly	6	370
F. Maestro	15	425
R. Auerbach	8	400
K. Sposare	5/12	125
T. Fyumo	3	390

Required:

a- Determine the amount that should be accrued each week for each employee.

b- Show next year's journal entry needed to distribute the weekly payroll, the Tom Thumb Corporation uses the perpetual cost accumulation system. To prepare the entry assume that no employees be on vacation.

10- The spring company has had an incentive plan for the past several years. The factory workers are paid $2.25 per unit with a minimum guaranteed wage of $175 per week. The report on employees' productivity for the week ending September 21, 2018 follows. All employees worked the 40 - hour week.

Weekly summary

Employees name	units produced
F. Chimienti	72
M. Donohue	80
G. Duchene	78
N. Grimsly	82
R. Strauss	68
S. Beeber	73
Total	453

Required:

a- Compute each employee's gross wages.

b- What amount should be charged to work in process?

c- What amount should be charged factory overhead?

11- Snoopy's Manufacturers, Ltd., awards a bonus at the end of the year equal to 3 weeks' salary to all employees who have been employed or more than one year. The payroll records shows the following information pertaining to next year:

Name	Years of employment	Weekly summary
B. Alexander	5	$225
M. Diskint	7	239
C. Ravel	2	150
P. Mahoney	3	200
S. Rapt	15	425
J. Terzella	10	375
N. Van Zandt	11/12	125
Total		$ 1739

Required:

a- Compute each employee's bonus and the total annual bonus payment.

b- Show the next years entry to be made each week to record the payroll. Including the bonus accrual. (Assume that the next years bonus cost will be the same as this years).

12- The midget manufacturing company pays its employees weekly. Following is the factory payroll summary prepared by the payroll department for the week ending July 15, 2018.

Payroll summary			
Name	**Direct labor hours**	**Indirect labor hours**	**Rate**
W. Bianco	39	1	$6.5
S. Cone	33	2	7.25
F. Giant	42	--	5.75
P. Malone	40	5	6
L. Palmeri	30	8	6.8
J. Teicher	36	3	7.1

Additional information:

FICA taxes - employee	$95
FICA taxes - employee	95
Federal & state income taxes withheld	156.06
Federal unemployment taxes	10.92
State unemployment taxes	42.13

Required: prepare the journal entries

a- To record the employ taxes and pay the payroll

b- To record the employers payroll taxes payable

13- Charger manufacturing company pays its employees weekly. The payroll summary prepared by the payroll department for the week ending September 24, 2018 ,follows:

Payroll summary				
Name	**Direct labor hours**	**Indirect labor hours**	**Rate**	**Total gross pay**
A	30	2	$5.25	$183.75
B	38	4	5.10	214.2
F	40	---	4.75	190
P	28	10	5.10	193
L	37	3	4.5	180
J	39	2	5	205
TOTAL				**$1166.75**

Additional information:

Total federal & state income taxes withheld	$116.68
Total FICA withheld	70.55

Required:

a- Prepare the journal entry to record the payroll.

b- Prepare the journal entry to record employee taxes and payroll.

14- Chaykin Corporation accumulated the following payroll data for the week ending April 10:

Employee	Hours worked	Base rate per hour
A	35	$5
I	50	6
B	35	7
X	48	8
M	51	6

Additional information:

a- The union contract requires that employees receive time and a half for any hour worked above 35 per week.

b- Mr. A worked the 1 A.M. to 9 A.M shift and will receive an additional $2 per hour above his $5 base rate. He worked the entire week on job1.

c- Mr. is overtime resulted from resulted from random scheduling of too many jobs. MR. I worked 25 hours on job2 and 25 hours on job 3.

d- Mr. B worked 30 hours on job 4. The rest of the time he was idle because his supervision forgot to order the necessary raw materials to complete the job.

e- Mr. X worked the entire week on job 5. Which was a rush order, the customer paid for special service.

f- Mr. M had to work overtime because he had to correct his own poor workmanship on job 6.

Required: prepare the journal entry to record payroll.

Chapter Five

Costing of Factory overhead

Chapter Five: Costing of Factory overhead

Introduction:

In chapters three and four, we discussed two of the three elements of product cost: materials and labor. In this chapter, we discuss the costing and control of third element, factory overhead. Factory overhead costs are those elements, which cannot be related to a specific product or department, but still essential elements for the benefits or the whole production or mostly represent a common elements for the existence of the manufacturing company. Accordingly, factory overhead cost appeared to be difficult to allocate between production and this leads to suggest a clustering technique, accompanied with a search behind each element to count its effect.

Factory overhead refers to the cost pool used to accumulate all indirect manufacturing costs (excluding selling, general, and administrative expenses because they are nonmanufacturing costs). Examples of factory overhead include the following:

- Indirect labor and indirect materials
- Heat, light, and power for the factory
- Rent on factory building
- Depreciation on factory building and factory equipment
- Motive power
- Maintenance of factory building and factory equipment
- property taxes on factory building
- supervisors' salaries

Factory overhead costs are divided into three categories on the basis of their behavior in relation to production. The categories are (1) variable costs, (2) fixed costs, and (3) mixed costs.

1. **Variable factory overhead costs.** Total variable factory overhead costs vary in direct proportion to the level production, within the relevant range, which was previously defined as that interval of activity within which total fixed costs and per unit variable costs remain constant: that is, the greater the number of units produced , the higher the total variable factory overhead cost. However, variable factory overhead cost per unit remains constant as production either increases or decreases. Examples of variable factory overhead costs are indirect materials and indirect labor.
2. **Fixed factory overhead costs.** Total fixed factory overhead costs remain constant within the relevant range regardless of the varying levels of production within that range. Examples of fixed factory overhead costs are property taxes, depreciation, and rent on the factory building.

3. **Mixed factory overhead costs.** Mixed factory overhead costs are neither wholly fixed nor wholly variable in nature but have characteristics of both. Mixed factory overhead costs must ultimately be separated into their fixed and variable components for purposes of planning and control. Examples of mixed factory overhead costs are factory truck rentals and factory telephone services (semi variable factory overhead costs) and factory supervisors and factory inspector salaries (step factory overhead costs).

Actual Versus Normal Costing of Factory Overhead:

In an **actual cost system**, product costs are only recorded when they are incurred. This technique is usually acceptable for the recording of direct materials and direct labor because they can be easily traced to specific jobs (job order costing) or department (process costing). Factory overhead, because it is an indirect element of product cost, usually cannot be easily or conveniently traced to a specific job or department. As a consequence, a modification of an actual cost system, called normal costing, is commonly used.

Under **normal costing**, costs are accumulated as they are incurred, with one exception: factory overhead is applied to production on the basis of actual inputs (hour, units) multiplied by a predetermined factory overhead application rate. This procedure is necessary because factory overhead costs are not incurred evenly throughout a period; Therefore, estimates must be made and a rate developed to apply factory overhead costs to jobs or departments as units are produced. The classification of factory overhead costs as variable, fixed, or mixed becomes important when the predetermined factory overhead application rate is computed.

Two key factors determine the factory overhead application rate for a period: (1) estimated of production (denominator) and (2) estimated factory overhead costs (number).

1. Estimated level of production:

In computing the factory overhead application rate for a period, the estimated level of production (the denominator of the predetermined rate) for the next period is an important consideration because total factory overhead is a combination of variable, fixed, and mixed costs. (Remember that fixed and mixed costs per unit are both affected by the volume of production, while variable cost per unit remains constant). The estimated level of production cannot, in the short run, exceed the firm's productive capacity. The productive capacity of a firm is dependent upon many factors: physical size and condition of the factory building and the factory equipment, availability of resources such as a trained labor force and various raw materials, etc. Under ideal situations, management usually sets the productive capacity on the basis of projected demand for the products

design, production specification, and desired annual production capacity and are instructed to design productive facilities. However, one of the biggest problems is that projected demand for the product, in many cases, is unknown or fluctuates annually. Should management plan for a small productive capacity and then expand as the products demand increases? This would seem the safe way except that it is usually more economical to build the optimum productive capacity at the outset than to make costly modifications. Management could start out with a large plant and hope to grow into it this is also uneconomical because the extra cost of the unused or idle productive capacity be absorbed by the units produced, which will result in an undesirable increase in unit cost. Many innovative approaches using sophisticated techniques have been developed to aid management in making decisions related to optimum plant capacity. For our purposes, we will assume that the productive facilities are already in place.

The next problem is to estimate the number of units that will be produced, during the next period, within the constraints of the existing productive facility. Should the estimate be based on the plant facilities maximum output under ideal conditions or should the figure allow for practical considerations, such as possible machinery breakdowns and labor absenteeism? What about marking considerations? Should estimates of production be tied into sales projections for the next period, or possibly the next few years? In reality, all the preceding factors and a significant number of other must be considered when projections are made. The following productive capacity levels may be used to project the level of production for the next period. **Capacity** is the ability to act in a certain way to achieve the main objective of a firm. The way of acting can be measured and expressed in terms of output units or service units.

a. **Theoretical or ideal productive capacity.** The maximum output that a department of factory is capable of producing, with no provision for either a lack of sales orders or interruptions in production (due to work stoppages, machines downtime for repairs and maintenance, set-up time, or ideal productive capacity. At this capacity level, the plant is assumed to function 24 hours a day, 7 days a week and 52 weeks a year without any interruptions in order to yield the highest physical output possible (i.e., 100% of plant capacity).
b. **Practical or realistic productive capacity.** The maximum production attainable, with a provision for anticipated and unavoidable interruptions in production but with no provision for a lack of sales orders, is called practical or realistic productive capacity. Practical capacity is the maximum capacity expected when the plant operates at a planned level of efficiency.

c. **Normal or long-run productive capacity.** The productive capacity based on practical productive capacity, tempered by the long-range productive customer demand for the product, is called normal or long-run productive capacity. Normal capacity is equal to or less than practical productive capacity. The long-range (usually 5 years) estimate of customer demand for the product is, in essence, a weighted average that smooths out seasonal, cyclical, and other variations in customer demand.

d. **Expected or short-run productive capacity.** Capacity based on estimated production for the next period is called expected or short–run productive capacity. In any one period, expected productive capacity can be more than, equal to, or less than normal productive capacity. In the long-run total expected productive capacity should equal total normal productive capacity.

Comparison of productive capacities:

The first two productive capacity levels, theoretical and practical, only take into consideration the physical capacity of a department or factory. Thus, if a company could sell everything it produced, these capacity levels could be used to compute the factory overhead application rate. However, this is rarely they except to sell. Therefore, sales projections are a vital factor in the planning process and must be considered when estimating production levels. For most companies, either normal productive capacity or excepted productive capacity is used to compute factory overhead costs because these two bases explicitly include projected customer demand in their estimates.

Expected productive capacity should be used in theory only when normal productive activity is difficult to determine. For example, assume that a company has a normal productive capacity of 200,000 units. Expected productive capacity for the current year is 160,000 units. Management expects production of 205,000 units in the following year. Fixed factory overhead costs are $180,000: variable factory overhead costs are $1.15 per unit. The factory overhead application rate computed for normal productive capacity and expected productive capacity are shown in table 1. Different factory overhead application rates result because the fixed factory overhead cost is spread over a greater number of units under normal productive capacity. The fixed factory overhead application rate is $0.90 per unit ($ 180,000÷200,000 units) under normal productive capacity, but it is $1.125 per unit ($180,000÷160,000) under expected productive capacity.

Table 1 factory overhead application rates

	Expected productive capacity	Normal productive capacity
Fixed factory overhead costs	$180,000	$180,000
Variables factory overhead costs:		
160,000 units × $1.15/unit	184,000	---------
200,000 units × $1.15/unit	----------	230,000
Total factory overhead costs	$364,000	$410,000
Divided by estimated units of production	160,000	200,000
Factory overhead application rate	$2.275*	$2.05**
* $1.15 variables + $1.125 fixed ** $1.15 variables + $0.90 fixed		

Normal productive capacity is used by firms that believe a products cost should be based on an average cost which takes into consideration production-related interruption and recurring fluctuations in customer demand. Assuming that all other factors remain constant, normal productive capacity results in uniform product costs per unit across different time periods. The use of normal productive capacity eliminates the possibility of manipulation of unit product cost by deliberately varying production levels. That is, in the presence of fixed factory overhead, deliberately increasing production decreases unit product cost while deliberately decreasing production increases unit product cost.

The use of expected productive capacity as a base usually provides a close approximation of next period's activity. Since expected productive capacity is based on a projection of next period's production, the amount of fixed factory overhead not absorbed by production should be kept to a minimum. Proponents of this productive capacity level believe that the major purpose of applying factory overhead is to approximate actual cost per unit produced. Using expected production as the basis for applying factory overhead should provide the closest approximation (out of the four possible productive capacity levels) of unit product cost for the next period. The major drawback in using expected productive capacity is that varying unit costs will result across different time periods if output varies appreciably.

For example, a large automobile manufacturer used expected productive capacity as a basis for computing its factory overhead application rate for each period. Since its sales price was based on production costs, the expected productive capacity exaggerated the effect of business cycles. In years when customer demand was low, fewer cars would be produced, which would cause the unit cost of production to increase, with a corresponding increase in sales price. This would lead to

further decreases in the number of cars sold. In years when customer demand was high, more cars would be produced, causing the unit cost of production to decrease, with a corresponding decrease in sales price. This would lead to further increases in the number of cars sold. To correct this situation, the company switched to normal productive capacity as a basis for computing its factory overhead application rate and setting its sales price.

Idle capacity and Excess capacity

Although no company can realistically hope to achieve full utilization of all its available productive capacity, the cost accounting information should account for the cost of unused productive capacity in such a manner as to lead to an appropriate response on the part of management. The cost of unused capacity should be separated into the cost of **excess capacity** and the cost of **idle capacity**.

The cost of **excess capacity** is a period cost. If a loss account is charged, management is made aware that something must be done to eliminate or at least reduce existing facilities that are in excess of what the sales department can ever hope to sell in the long run. For that portion of the existing facilities that cannot be reduced, an alternative use should be found.

The cost of **idle capacity** is a product cost. Existing facilities will be temporarily unused as a result of seasonal and cyclical variations in customer demand. This is unavoidable and a necessary cost of providing a normal level of productive capacity.

2. Estimated Factory Overhead Costs:

Once the estimated level of production has been determined, a company must develop some means of arriving at a satisfactory estimate of factory overhead costs - the numerator of the predetermined rate. A budget of estimate factory overhead costs for the next period is usually prepared. Each item must be classified as either fixed estimate factory overhead or variable factory overhead. (Mixed costs have to be divided into their fixed and variable components). Total fixed costs do not change as production levels change within the relevant range: therefore, the level of production is not a factor in determining total fixed costs. Total variable costs, on the other hand, vary in direct proportion to changes in the level of production: therefore, the level of production is a factor in determining total variable portion of factory overhead costs.

For example, assume the following information for 2018 for the stone corporation, which manufactures one product, in one department, and uses a process cost system to accumulate costs:

Normal capacity, in unit	250,000
Normal capacity, in direct labor hours (2 direct Labor hours per unit)	500,000
Relevant range of production:	
In units	100,000 - 400,000
In direct labor hours	200,000 - 800,000
Factory overhead costs:	
Variable factory overhead:	
Indirect materials, average per unit	$0.50
Indirect labor costs, average per hour	$5.00
Indirect labor hours (3% of 500,000 direct labor hours)	15,000
Fuel to run factory equipment, average per machine hour	$30.00
Equipment hours required (3% of 500,000 direct labor hours)	15,000
Fixed factory overhead:	
Factory rent	$300,000
Depreciation of factory equipment	$50,000

A budget of the estimated factory overhead costs for the next period, 2018, is shown in table 2. This is called a static budget because it represents only one level of production (i.e., 250,000 units).

Table 2 Stone Corporation: static factory overhead budget for 2018

Estimated units of production at normal capacity	250,000
Estimated direct labor hours at normal capacity (2 direct labor hours per unit)	500,000
Variable factory overhead costs:	
Indirect materials ($0.50 \ unit × 250,000 unit)	$125,000
Indirect labor ($5.00\hour × 15,000 indirect labor hours)	75,000
Fuel for equipment ($30.00\machine hour × 15,000 machine hours)	450,000
Total variable factory overhead costs	$650,000
Fixed factory overhead costs:	
Factory rent	$300,000
Depreciation of factory equipment	50,000
Total fixed factory costs	$350,000
Total factory overhead costs	$1,000,000

Determination of factory overhead application rates:

Once the levels of production and factory overhead costs for the next period have been estimated, the predetermined factory overhead application rate for the next period can be computed. Determining the factory overhead cost rates: this means the determination of the cost of producing a unit of production/service in a production center. This requires a foundation and a basis of determination. **Factory overhead application rates** are generally in terms of dollars per unit of estimated activity of some base (called denominator activity). There are no definitive rules for determining which base to uses as the denominator activity. However, there must be a direct relationship between the base and factory overhead costs. Also, the method used to determine the factory overhead application rate should be the simplest and least costly to compute and apply. Once total factory overhead costs have been estimated and the base chosen, the normal capacity activity level must be estimated in order to compute the factory overhead application rate. The formula for computing the factory overhead application rate, which is the same regardless of the base chosen, is as follow:

$$\frac{\text{Estimated factory overhead costs}}{\text{Estimated base at denominator activity}} = \text{Factory overhead application rate per unit, hour. Dollar, * etc.}$$

* For bases expressed in dollars, the rate is expressed as a percentage by the rate by 100.

These bases are commonly used to compute the factory overhead application rate:

(1) Units of production

(2) Direct materials cost

(3) Direct labor cost

(4) Direct labor hours, and

(5) Machine hours.

1. Units of production:

This method is very simple, since data on the units produced are readily available for applying factory overhead. The formula is as follows:

$$\frac{\text{Estimated factory overhead costs}}{\text{Estimated units of production}} = \text{Factory overhead application rate per unit of production}$$

The data for following illustration are based on the Stone Corporation's static factory overhead budget at the normal productive capacity level (table 2). The estimated factory overhead costs for the period are $1,000,000 and normal productive capacity is 250,000 units. The factory overhead application rate using the units of production method would be computed as follows:

$$\frac{\$1{,}000{,}000}{250{,}000 \text{ units}} = \$4.00 \text{ per unit of production}$$

This method applies factory overhead equally to each unit produced and is appropriate when a company or department manufactures only one product.

2. Direct materials cost:

This method is suitable when can be determined that a direct relationship exists between factory overhead costs and direct materials cost. When direct materials are a very large part of total cost, it may be inferred that the factory overhead costs are directly related to direct materials. The formula is as follows:

$$\frac{\text{Estimated factory overhead costs}}{\text{Estimated direct materials cost}} \times 100 = \text{percentage of direct materials cost}$$

For example, Stone Corporation's estimated factory overhead costs for the period is $1,000,000; assume that the estimated direct materials cost is $500,000. Using direct materials cost as the base, the factory overhead application rate is computed as follows:

$$\frac{\$1{,}000{,}000}{\$500{,}000} \times 100 = 200\% \text{ of direct materials cost}$$

One problem in using direct materials cost as a base where more than one product is manufactured is that different products require varying quantities and types of direct materials with different acquisition costs. Therefore, different factory overhead application rates should be determined for each product. As can be seen, we are beginning to move away from one of our objectives - simplicity - with the use of multiple rates. This should indicate to management that perhaps another base would be more appropriate.

3. <u>Direct labor cost:</u>

This is most widely used because direct labor costs are generally closely related to factory overhead cost, and payroll data are readily available. It therefore meets our objectives of having a direct relationship to factory overhead cost, being simple to compute and apply, and requiring little, if any, additional cost to compute. Thus this method is appropriate when a direct relationship exists between direct labor cost and factory overhead. (There are, however, situations where there is little relationship between direct labor costs and factory overhead and this method would not be appropriate.

For example, factory overhead costs may be composed largely of depreciation and equipment-related costs). The formula is as follows:

$$\frac{\text{Estimated factory overhead costs}}{\text{Estimated direct labor cost}} \times 100 = \text{percentage of direct labor cost}$$

If estimated factory overhead costs are $1,000,000 and estimated direct labor costs are $2,000,000 (500,000 direct labor hours at an assumed $4 per direct labor hour), the Stone Corporations factory overhead application rate would be compute as follows:

$$\frac{\$1,000,000}{\$2,000,000} \times 100 = 50\% \text{ of direct labor cost}$$

If there is a direct relationship between factory overhead cost and direct labor cost, but wage rates vary greatly within departments, the following base may be more preferable.

4. Direct labor hours:

This method is appropriate when there is a direct relationship between factory overhead costs and direct labor hours, and when there is a significant disparity in hourly wage rates. Timekeeping records must be accumulated to provide the data necessary for applying this rate. The formula is as follows:

Estimated factory overhead costs / Estimated direct labor hours	=	factory overhead application rate per direct labor hour

Assume that the Stone corporation's estimated factory overhead for the period is $1,000,000 and estimated direct labor hours are 500,000 (250,000 units at 2 direct labor hours per unit). The factory overhead application rate, based on direct labor hours, would be computed as follows:

$1,000,000 / $5,000,000 direct labor hours	=	$2.00 per direct labor hour

This method, like the direct cost method, would be inappropriate if factory overhead costs were composed of costs unrelated to labor activity.

5. Machine hours:

This method uses the time required for machines to perform similar operations as a base in computing the factory overhead application rate. This method is appropriate when a direct relationship exists between factory overhead costs and machine hours.

This generally occurs in companies or departments that are largely automated so that the majority of factory overhead costs consist of depreciation on factory equipment and other equipment- related costs. The formula is as follows:

Estimated factory overhead costs / Estimated machine hours	=	factory overhead application rate per machine hour

Assume that the stone corporations estimated factory overhead costs for the period are $1,000,000 and estimated machine hours are 15,000, as per table 2. The factory overhead application rate would be computed as follows:

$1,000,000 / 15,000 machine hours	=	$66.7 per machine hour

The disadvantage of this method is the additional cost and time involved in summarizing total machine hours per unit. Since every company is different, the decision regarding which base is appropriate for a particular manufacturing operation must be made by management after careful analysis.

Applied factory overhead cost:

After the factory overhead application rate has been determined, it is used to apply (or match) estimated factory overhead costs to production. The estimated factory overhead costs are applied to production on an on-going basis as goods are manufactured, according to the base used (i.e. as a percentage of direct materials costs or direct labor cost or on the basis of direct labor hours, machine hours, or units produced). For example, assume that the factory overhead application rate was determined to be $2 per direct labor hours, using direct labor hours as a base, and that 100,000 actual direct labor hours were worked. The $200,000 (100,000 × $2) of estimated factory overhead would have been applied to production during the period in relation to the direct labor hours which actually worked.

Actual factory overhead costs:

Actual Factory Overhead Costs are usually incurred daily and recorded periodically in the general and subsidiary ledgers. Subsidiary ledgers permit a greater degree of control over factory overhead costs as related accounts can be grouped together and the various expenses incurred by different departments can be described in detail.

Factory overhead encompasses many different items and involves a variety of accounts. For this reason, some companies develop a chart of account that indicates the account to which specific factory overhead costs are to be charged.

Accounting for actual factory overhead costs:

Factory overhead charges are gathered from many sources, such as the following:

1- Invoice. Bills received from suppliers or service organizations
2- Vouchers. Paid bills
3- Accruals. Adjustment for items like accrued utilities payable
4- Year-end adjusting entries. Adjustments for items like depreciation and amortization expense

Manufacturing companies commonly use a departmental factory overhead cost sheet for the analysis of factory overhead costs. Each department maintains a departmental factory overhead cost sheet which is subsidiary ledger of factory overhead control account. These sheets are detailed records of the amount of total factory overhead actually incurred for each department. Reconciliation of the control and subsidiary ledgers should be performed at regular intervals.

Table (3) is a department factory overhead coast sheet for processing department, using the following facts for the month of April:

Date	Item	Amount
3\4	Indirect materials requisitions	$800
3\4 - 20\4	Job tickets –indirect labor	1,200
10/4	Miscellaneous invoices	7,000
30/4	Utilities	1,500
30/4	Adjusting entries-depreciation/machinery	2,000
Total		$12,500

Table (3) department factory overhead cost sheet: processing department

		Indirect labor			Other				
Date	Source	Indirect material	Regular	Over-time	Depre.: machinery	Depre.: factory	Utilities	Misc.	Total overhead
3\4	Materials requisitions	$800							$800
3\4 – 20/4	Job tickets		$1,200						1,200
10/4	Miscellaneous invoices							$7,000	7,000
30/4	Utilities						$1,500		1,500
30/4	Adjusting entries				$2,000				2,000
Total		$800	$1,200		$2,000		$1,500	$7,000	$12,500

Journalizing factory overhead:

The journal entries to record factory overhead costs under either a job cost order cost system or process system are basically the same. The major difference is that under a job order cost system applied factory overhead is accumulated by job whereas under a process cost system applied factory overhead is accumulated by departments.

Both actual and applied factory overhead costs must be recorded. Actual factory overhead costs are charged (debited) to a factory overhead control account when the costs are incurred. Factory overhead costs are applied as production occurs by charging work in process inventory. A predetermined factory overhead application rate is used to apply factory overhead costs to the work in process inventory account. The credit in this entry is to factory overhead applied account. The purpose of using two separate factory overhead accounts is that the debit balance in factory overhead control account represents the total actual factory overhead incurred while the credit balance in the factory overhead applied account represents total factory overhead applied. This information would be lost if only one account were used to record both actual and applied factory overhead.

At the end of the period, the total credits balance in the factory overhead applied account is closed against the total debit balance in factory overhead control. Any different between the balance in these two accounts is recorded as underapplied (debit balance) or overapplied credit balance (credit balance) factory overhead. Continuing our example of Stone Corporation, the actual information for the Stone Corporation for 2018 is presented in the table 4.

The following summary journal entries for the stone corporation for the year ended 2018 relate to factory overhead:

Table (4) Stone Corporation: actual cost and production data for 2018

Actual units produced (100% complete)	200,000
Actual direct labor hour	400,000
No beginning or ending work –in-process exists.	
Actual factory overhead costs:	
Variable factory overhead costs:	
Indirect material	$100,000
Indirect labor	60,000
Fuel for equipment	360,000
Total variable factory overhead costs	$520,000
Fixed factory overhead costs:	
Factory rent	$300,000
Depreciation of factory equipment	50,000
Total fixed factory overhead costs	$350,000
Total factory overhead costs	$870,000

To apply factory overhead to production assuming direct labor hours are used as the base:

Work in process inventory	800,000	
Factory overhead applied		800,000

($2.00 per labor hour x 400,000 actual direct labor hours)

To record actual factory overhead:

Factory overhead control	870,000	
Various credits		870,000

Note: various credits include materials inventory, payroll payables, cash, accumulated depreciation of factory equipment, etc.

To close factory overhead applied and factory overhead control:

Factory overhead applied	800,000	
Underapplied factory overhead	70,000	
Factory overhead control		870,000

Analysis of Underapplied or Overapplied factory overhead

The difference between applied factory overhead and actual factory overhead should be analyzed to determine the cause (s). The difference or variance can usually be isolated into the following categories:

1- **Price variance.** Results when a company spends more or less on factory overhead than anticipated. For example, an unexpected increase in the price of indirect materials would increase total variable factory overhead costs: an unexpected increase in the price of factory insurance would increase total fixed factory overhead costs.

2- **Efficiency variance.** Results when workers are more or less efficient than planned. That is, workers may take longer time than expected to generate production. Consequently , equipment, for example , used to produce the units must be run longer than it should be run, which will increase total factory overhead costs because more fuel and other equipment-related costs will be unnecessarily incurred.

3- **Production volume variance.** Results when the activity level used to calculate the predetermined factory overhead application rate is different from the actual production level achieved. A production volume variance is a fixed factory overhead phenomenon that results from having to apply fixed factory overhead to production as if it were a variable cost in order to determine a product's cost. For example, when the actual production is less than denominator activity, fixed factory overhead will be under applied.

Accounting For the Difference between Applied and Actual Factory Overhead

The amount of factory overhead applied during a period will seldom equal the actual factory overhead incurred because the predetermined factory overhead application rate is based on both an estimated numerator (factory overhead costs) and an estimated denominator (productive capacity). Insignificant differences are usually treated as a period cost by adjusting cost of goods sold. Significant differences should be prorated to work in process inventory, finished goods inventory, and cost of goods sold, in proportion to the unadjusted factory overhead balance in each account. The objective is to allocate the under or over applied factory overhead to those accounts that were distorted by using what unintentionally proved to be the incorrect application rate and thereby to adjust their ending balances to approximate what they would have been if the correct application rate had been used. When a job order cost system is used to accumulate costs, the factory overhead applied to individual jobs must also be adjusted under a process cost system, the factory overhead assigned to each department must be adjusted.

Continuing the example of the stone corporation, assume the following additional information:

Units sold	180,000
Units in finished goods inventory	20,000
Units in work-in-process inventory	0
Total units produced	200,000

Unadjusted factory overhead costs in:

	Dollars	Percentage of total
Cost of goods sold (180,000 units sold x $2.00/ direct labor hour x 2 direct labor hours/unit)	$720.000	90%*
Finished goods inventory (20,000 units $2,00/ direct labor hour x 2 direct labor hours/unit)	80,000	10%**
Total	$800.000	100%

*$720.000 ÷$800,000 = 90%

**$80,000 ÷ $800.000 = 10%

The following entry would be made to prorate the $70,000 of underapplied factory overhead for the Stone ration:

Cost of goods sold (90% x $70,000)	63000	
Finished goods inventory (10 % x $70,000)	7000	
Underapplied factory overhead		70000

Allocation of Budgeted Service Department Costs to Producing Departments:

Cost allocation involves the assignment of direct and indirect manufacturing costs to various categories. A cost may be reallocated several times within a production cycle. For example, the cost of raw materials purchased is initially allocated to materials inventory. As materials are put into production the cost is reallocated from materials inventory to work-in-process inventory (if they are direct materials) or factory overhead control (if they are indirect materials). The cost of work-in-process inventory is eventually reallocated to finished goods inventory and ultimately to cost of goods sold. Cost allocation is important for many reasons, the most important of which are income determination, asset valuation, performance evaluation, and decision making.

When a company manufactures more than one product it is important that factory overhead costs be allocated to departments or cost centers in order to match factory overhead costs to specific jobs or departments. Therefore, when multiple products are produced a single factory wide factory overhead application rate is not appropriate for allocating factory overhead costs. Before a department or cost center factory overhead application rate can be computed, the total budgeted service department costs must first be allocated to producing departments. A **service department** is a department which provides benefits to producing departments and/or service departments. A **producing department** (also called a line department) is a department in which material conversion or production takes place. Examples of service departments are the maintenance department, which is responsible for the upkeep of the machinery, building, and grounds; and the utility department, which is responsible for providing electricity of heating and lighting the factory.

Since producing departments are directly benefited by service departments, the total budgeted costs of operating the service departments must be allocated to the producing departments. (Allocated total budgeted service department costs are just as much indirect manufacturing costs as are the indirect materials and indirect labor of producing departments). Once the total budgeted service department costs have been allocated to producing departments, the factory overhead application rate for each producing department can be computed.

Budgets for service and producing departments should be prepared before the allocation process is begun. Total budgeted service department costs that can be traced to a specific producing department should be allocated directly to that department. For example, if the repairs and maintenance department plans to purchase fan belts that fit only the equipment used in the assembly department then the budgeted cost of the fan belts expected to be replaced during the next period should be charged directly to the assembly department. Total budgeted services department costs that cannot be identified with a specific department must be separated into variable and fixed cost components and both groups must be independently allocated to producing departments. The

allocation of the variable and fixed service department total budgeted costs that cannot be directly traced to a specific department is made by using a basis that has some relationship (correlation) between services rendered and costs incurred. For example, the square footage of the producing departments may be used as a basis to allocate janitorial department costs if it is found that the physical size of a department is a good indicator of how long it takes the janitors to clean the area. However, square footage may be inappropriate if, for example, the cutting department is half the size of the assembly department but takes twice as long as clean because it produces more waste than the assembly department.

Once a basis for allocation has been determined, a method of allocation must be selected. The following methods are commonly used to allocate service department total budgeted costs to producing departments: (1) direct method, (2) step method, and (3) algebraic method.

1. Direct Method:

The direct method is the one most commonly used for allocating total budgeted service department costs because of mathematical simplicity and ease of application. Under this method, service department total budgeted costs are allocated directly to the producing departments, ignoring any services rendered by services department to each other. (For example, the building and grounds maintenance department may service the personnel department, and the personnel department may provide services to the building and grounds maintenance department). The direct method is appropriate for allocating service department total budgeted costs when no reciprocal services exist.

For example, the Crane Manufacturing Company has two service departments and two producing departments. The total budgeted cost for the period of each department is shown in Table 6 Assume that the total budgeted cost of the building and grounds maintenance department is allocated to the machinery and assembly departments, on the basis of the estimated number of squire feet: the total budgeted cost of the general factory administration department is allocated using estimated total labor hours. The factory overhead application rates for the producing departments are based on estimated direct labor hours.

Table 6 Crane manufacturing Company: total budgeted overhead cost

Service departments (total estimated costs):			
Department X-Building and Grounds Maintenance			$ 10,000
Department Y-General Factory Administration			7,500
Producing Departments (Estimated Factory Overhead Costs):			
Department A-Machinery			36,500
Department B-Assembly			44,600
Department	Estimate direct labor hours	Estimated square feet	Estimated total labor hours
X-Building and Grounds Maintenance	……	700	1,000
Y-General Factory Administration	…..	500	700
A-Machinery	1,800	1,000	2,800
B-Assembly	950	3,000	1,200
Total	**2,750**	**5,200**	**5,700**

To simplify the illustration, variable costs and fixed costs will be allocated together. The allocation of total budgeted service department costs to producing departments under the direct method is computed in table 7.

Table 7 Allocation of Costs: Direct Method

	Service Depts.		Producing Depts.	
	Dept. X	**Dept. Y**	**Dept. A**	**Dept. B**
Total budgeted costs	$ 10,000	$ 7,500	$ 36,500	$ 44,600
Allocated to producing departments A and B	(10,000)		2,500 (1)	7,500 (2)
		(7,500)	5,250 (3)	2,250 (4)
Balance after allocation	$ 0	$ 0	$ 44,250	$ 54,350
Factory overhead application rates (direct labor hour)			$ 24.58 (5)	$ 57.21(6)

Computations

Allocations of department X, Building and Grounds Maintenance

Total budgeted costs ÷ square feet of Dept. A and B = $10,000 ÷ 4,000 = $2.5 per square foot

		Square Feet	×	Rate per square foot
1) To Dep A-Machinery	$ 2,500	1,000	×	$ 2.50
2) To Dep B-Assembly	7,500	3,000	×	2.50
Total	$ 10,000			

Allocations of department Y, General Factory Administration

Total budgeted costs ÷ total labor hours of Dept. A and B = $7,500 ÷ 4,000 = $1.875 per total labor hour

		Total labor hours	×	Rate per Total labor hours
3) To Dep A-Machinery	$ 5,250	2,800	×	$ 1.875
4) To Dep B-Assembly	2,250	1,200	×	1.875
Total	$ 7,500			

Factory overhead application rate (on the basis of direct labor hours) for producing departments:

		Total cost after allocation	÷	Direct labor hours
5) For Dep A-Machinery	$24.58/direct labor hour	$44,250	÷	1,800
6) For Dep B-Assembly	$57.21/direct labor hour	$54,350	÷	950

2. Step Method

The step method is more accurate than the direct method when a service department services another service department because it takes into consideration the services provided by one service department to another service department the allocation of budgeted service department costs is performed by a series of steps as follows:

A. The budgeted costs of the service department that provides services to the greatest number of other service departments are usually allocated first.

B. The budgeted costs of the service department that provides services to the next greatest number of service departments are then allocated. Any budgeted costs added to this department from step A are included. Note that under this method, once a service department's budgeted costs have been allocated to other departments, no additional budgeted costs can be allocated back to it. That is, the department whose budgeted costs were allocated in step A will not receive any cost allocation from the second department.

C. This sequence is continued, step by step, until all the budgeted service department costs have been allocated to producing departments.

For example, assume that the total budgeted costs of the Building and Grounds Maintenance department are allocated first, followed by the allocation of the total budgeted costs of the General Factory Administration department. For the Crane Manufacturing Company, the allocation of total budgeted service department costs to producing departments under step method is shown in table 8.

Note that the difference between the direct method and the step method is the allocation of the total budgeted costs of one service department (department X) to the other service department (department Y), which is made only under the step method.

Table (8): Allocation of Costs: Step Method

		Service Depts.		Producing Depts.	
		Dept. X	**Dept. Y**	**Dept. A**	**Dept. B**
Total budgeted costs		$ 10,000	$ 7,500	$ 36,500	$ 44,600
Allocated to Depts. Y, A and B		(10,000)	1,111 (1)	2,222 (2)	6,667 (3)
Subtotal			$ 8,611	$ 38,722	$ 51,267
Allocated to Producing departments A and B			(8,611)	6,028 (4)	2,583 (5)
Balance after allocation		$ 0	$ 0	$44,750	$53,850
Factory overhead application rates (direct labor hour)				$24.86 (6)	$56.68 (7)

Computations

Allocations of department X, Building and Grounds Maintenance

Total budgeted costs ÷ square feet of Dept. Y, A, and B = $10,000 ÷ 4,500 = $2.2222 per square foot

		Square Feet	**×**	**Rate per square foot**
1) To Dep Y, General Factory Administration	$ 1,111	500	×	2.2222
2) To Dep A-Machinery	2,222	1,000	×	2.2222
3) To Dep B-Assembly	6,667	3,000	×	2.2222
Total	$ 10,000			

Allocations of department Y, General Factory Administration

Total budgeted costs ÷ Total labor hours of Depts. A and B= 8,611 ÷ 4,000 = 2.1527 per total labor hours

		Total labor hours	**×**	**Rate per Total labor hours**
4) To Dep A-Machinery	$ 6,028	2,800	×	2.1527
5) To Dep B-Assembly	2,583	1,200	×	2.1527
Total	$ 8,611			

Factory overhead application rate (on the basis of direct labor hours) for producing departments:

	Total cost after allocation	**÷**	**Direct labor hours**
6) For Dep A-Machinery $24.86/direct labor hour	$44,750	÷	1,800
7) For Dep B-Assembly $56.68/direct labor hour	$53,850	÷	950

3. Algebraic (Reciprocal) Method

The algebraic method is the most appropriate of the three allocation methods when reciprocal services exist because it considers any reciprocal services provided between service departments. For example, Service Department A and Service Department B provide services to each other.

Under the direct method, no service department budgeted costs are allocated from one service department to another service department. In the step method, service department budgeted costs are allocated to other service departments. However, reciprocal allocation is not possible because each service department account is closed once its costs have been allocated and no further costs can be allocated back to it. Thus, the direct and step methods ignore the allocation of reciprocal services. With the algebraic method, the use of "simultaneous equations" allows for reciprocal allocation because every department serviced will be allocated budgeted costs from the department providing the service. When reciprocal services are not extensive, it is possible to arrive at an acceptable approximation by using the step method.

In our example, there are two service and two producing departments; thus, two equations will be solved simultaneously. When the number of departments is large, more equations are required, in which case, the use of a computer facilitates the computations.

The allocation of total budgeted service department costs to producing departments according to the algebraic method is computed as follows:

Continuing the example of the Crane Manufacturing Company, the ratio or percentage of services provided by one service department to another service department must first be computed by setting up the following schedule:

	SERVICES PROVIDED BY:	
	Department Y (Allocated using square feet)	Department X (Allocated using total labor hours)
Service Department:		
X	-------	1,000
Y	500	------
Producing Department:		
A	1,000	2,800
B	3,000	1,200
Total	4,500	5,000

Notice in the schedule above that the column representing services provided by Department X does not include the 700 square feet of Department X because all of Department X's budgeted costs are to be allocated to other departments and the column representing services provided by Department Y does not include the 700 estimated total labor hours of Department Y, because all of Department Y's costs are to be allocated to the other departments.

The percentages of services provided by one service department to another service department can now be determined as follows:

Services received by Service Department X from Service Department Y:

$$\frac{\text{1,000 labor hours}}{\text{5,000 total labor hours}} = 20\% \text{ of the total services provided by Department Y}$$

Services received by Service Department Y from Service Department X.

$$\frac{\text{500 square feet}}{\text{4,500 total square feet}} = 11.11\% \text{ of the total services provided by Department X}$$

The total budgeted cost to be allocated to Department X (Building and Grounds Maintenance) is equal to $10,000 plus 20% of the cost of Department Y (General Factory Administration). Stated algebraically, this appears as follows:

$$X = \$10{,}000 + 0.20\ Y$$

The total budgeted cost to be allocated to Department Y is equal to $7,500 plus 11.11% of the cost of Department X. Stated algebraically, this appears as follows:

$$Y = \$7{,}500 + 0.1111\ X$$

The next step is to solve the equations simultaneously for either X or Y. In our example, we will solve for Y first (both equations have only two unknowns so either one may be solved first). The Department X equation is substituted for the X in the Department Y equation as follows:

$$Y = \$7{,}500 + 0.1111\ (\$10{,}000 + 0.20\ Y)$$

Now only one unknown exists in the equation for Department Y, and it may be solved as follows:

$$Y = \$7{,}500 + \$1{,}111 + 0.0222\ Y$$

$$0.9778\ Y = \$8{,}611$$

$$Y = \$8{,}807$$

Now that we have the cost for Department Y, it may be substituted for Y in the Department X equation, as follows:

$$X = \$10{,}000 + 0.20\ Y$$

$$= \$10{,}000 + 0.20\ (\$8{,}807)$$

$$= \$10{,}000 + \$1{,}761 = \$11{,}761$$

The allocation of total budgeted service department costs is illustrated in Table 9.

Table (9): Allocation of Costs: Algebraic Method

		Service Depts.		Producing Depts.	
		Dept. X	**Dept. Y**	**Dept. A**	**Dept. B**
Total budgeted costs		$ 10,000	$ 7,500	$ 36,500	$ 44,600
Allocated to Depts. Y, A and B		(11,761) (1)	1,307 (3)	2,613 (4)	7,814 (5)
Allocated to Depts. X, A and B		1,761 (6)	(8,807) (2)	4,932 (7)	2,114 (8)
Balance after allocation		$ 0	$ 0	$44,045	$54,555
Factory overhead application rates (direct labor hour)				24.47 (9)	57.43 (10)

Computations

(1) From Equation X

(2) From Equation Y

Allocations of department X, Building and Grounds Maintenance

Total budgeted costs ÷ square feet of Dept. Y, A, and B = $11,761 ÷ 4,500 = $2.6135 per square foot

		Square Feet	**×**	**Rate per square foot**
(3) To Dep Y, General Factory Administration	$ 1,307	500	×	2. 6135
(4) To Dep A-Machinery	2,613	1,000	×	2. 6135
(5) To Dep B-Assembly	7,841	3,000	×	2. 6135
Total	$ 11,761			

Allocations of department Y, General Factory Administration

Total budgeted costs ÷ Total labor hours of Depts. X, A, B = 8,807 ÷ 5,000 = 1.7614 per total labor hours

		Total labor hours	**×**	**Rate per Total labor hours**
(6) To Dep X, Building and Grounds Maintenance	$ 1,761	1,000	×	1.7614
(7) To Dep A-Machinery	4,932	2,800	×	1.7614
(8) To Dep B-Assembly	2,114	1,200	x	1.7614
Total	$ 8,807			

Factory overhead application rate (on the basis of direct labor hours) for producing departments:

	Total cost after allocation	**÷**	**Direct labor hours**
(9) For Dep A-Machinery $24.47/direct labor hour	$44,045	÷	1,800
(10) For Dep B-Assembly $57.43/direct labor hour	$54,555	÷	950

Allocation of actual Service Department Costs to Producing Departments

We have just illustrated the use of the two alternative cost methods: direct and step. The selected method was used to allocate budgeted service department costs to producing departments at the beginning of the period as a necessary prerequisite to the determination of the producing department's predetermined factory overhead application rates. Service departments benefit producing departments in that their costs are properly accounted for as factory overhead costs of producing departments and thus they can be attached to products via the predetermined factory overhead application rates.

During the accounting period, actual factory overhead costs are debited to a Factory Overhead Control and a parallel treatment is accorded actual service department costs, which are debited to service department Cost Control Account. Given the existence of service departments, we cannot directly proceed to a comparison of the Factory Overhead Applied Account and the Factory Overhead Control Account for the purpose of determining under or over applied factory overhead because the Factory Overhead Control account's debit balance at the end of the period consists only of the actual producing department Factory Overhead costs. Clearly, Factory Overhead Applied and Factory Overhead Control Accounts, as they exist at present, cannot be meaningfully compared until the Factory Overhead Control Account is adjusted at the end of the period to include the actual service department costs. Therefore, it is necessary to allocate actual service department costs to producing departments at the end of the period. Once this allocation is made using the direct step method, a journal entry follows to transfer the actual costs out of the service department Cost Control Accounts and into the Factory Overhead Control Accounts. After this journal entry and corresponding posting to appropriate general ledger accounts, Factory Overhead Applied and Factory Overhead Control can be compared, under or over applied factory overhead computed and the applicable end of period journal entry made.

An end of period allocation of actual service department costs to producing departments will be illustrated using the Crane Manufacturing Company. Recall that the company has two service departments and two producing department. The total actual overhead cost for the period for each department is shown in table 10.

Table (10) Crane Manufacturing Company: Total Actual Costs

Service departments			
Department X		$ 11,000	
Department Y		7,900	
Producing departments			
Department A		38,400	
Department B		43,700	
Additional Information			
Department	**Actual Direct Labor Hours**	**Actual Square Feet**	**Actual Total Labor Hours**
X - Building and Grounds Maintenance	…	650	1,400
Y- General Factory Administration	…	550	900
A - Machinery	1,700	1,300	3,000
B - Assembly	1,000	2,600	1,500
Total	$2,700	5,100	6,800
Factory overhead control Department A $38,400 (Dr.)	Factory overhead applied Department A $41,786 (Cr.) ($24.58/DLH×1,700 actual DLH)		
Factory overhead control Department B $43,700 (Dr.)	Factory overhead applied Department B $57,210 (Cr.) ($57.21/DLH×1,000 actual DLH)		
Department X cost control $ 11,000 (Dr.)	Department Y cost control $ 7,900 (Dr.)		

It should be noted that Factory Overhead Applied accounts have end of period balances based on actual direct labor hours (table 10) times the predetermined factory overhead application rates (table 7, direct method) of $ 24.58 and $ 57.21 per direct labor hour for Machinery and Assembly departments, respectively.

The actual cost of department X is allocated to A and B departments, on the basis of the actual number of square feet, and the actual cost of department Y is allocated, using actual total labor hours.

The allocation of actual services department costs to producing departments under the direct method is computing in table (11).

Table (11) Allocation of Costs: Direct Method

		Service departments		Producing departments	
		Dept. X	**Dept. Y**	**Dept. A**	**Dept. B**
Total actual costs		$ 11,000	$ 7,900	$ 38,400	$ 43,700
Allocated to departments A and B		(11,000)		3,667 (1)	7,333(2)
			(7,900)	5,267(3)	2,633 (4)
Balance after allocation		**$ 0**	**$ 0**	**$ 47,334**	**$ 53,666**
Computations					
Allocations of department X, Building and Grounds Maintenance					
Total costs ÷ square feet of Depts. and B = $11,000÷ 3,900 = $2.82 per square foot					
			Square Feet	×	Rate per square foot
1) To Dep A-Machinery		$ 3,667	1,300	×	$ 2.82
2) To Dep B-Assembly		7,333	2600	×	$ 2.82
Total		$ 11,000			
Allocations of department Y, General Factory Administration					
Total costs ÷ Total labor hours of Depts. A and B= 7,900 ÷ 4,500 labor hours = 1.7555 per total labor hours					
			Total labor hours	×	Rate per Total labor hours
3) To Dep A-Machinery		$ 5,267	3,000	×	$ 1.75555
4) To Dep B-Assembly		2,633	1,500	×	1.75555
Total		$ 7,900			

After total actual service department costs are allocated to producing departments as shown in table 11, the following entries are made:

Factory overhead control- Machinery (A)	3,667	
Building and Grounds Maintenance (X) Cost Control		3,667
Factory overhead control- Assembly (B)	7,333	
Building and Grounds Maintenance (X) Cost Control		7,333
Factory overhead control- Machinery (A)	5,267	
General Factory Administration (Y) Cost Control		5,267
Factory overhead control- Assembly (B)	2,633	
General Factory Administration (Y) Cost Control		2,633

As a result of the journal entries above, the two service department cost control accounts are closed and their balances transferred as per table 11 to the two producing department factory overhead control accounts. The next step in the computation of under or over applied factory overhead as follows:

	Machinery	Assembly
End-of-period balance in factory overhead control after allocation (table 11)	$ 47,334	$ 53,666
End-of-period balance in factory overhead applied (table 10)	41,786	57,210
Underapplied factory overhead	$ 5,548	
Overapplied factory overhead		$ 3,544

The final step is record the $ 5,548 of underapplied factory overhead and the $ 3,544 of overapplied factory as follows:

Factory overhead control- Machinery	41,786	
Underapplied factory overhead – Machinery	5,548	
Factory overhead control- Machinery		47,334
(38,400 + 3,667 + 5,267) = 47,334		
Factory overhead applied - Assembly	57,210	
Overapplied factory overhead- Assembly		3,544
Factory overhead control- Assembly		53,666
(43,700 + 7,333 + 2,633) = 53,666		

Example:

The Capricorn Corporation has the following information related to applied and actual factory overhead:

Factory overhead control	$ 30500
Applied factory overhead	$ 39700

Applied factory overhead costs are in the following accounts:

Cost of goods sold	32000
Ending work-in-process inventory	3500
Ending finished goods inventory	4200

Required:

a. Allocate the under- or overapplied factory overhead to those accounts distorted by using what turned out to be an incorrect factory overhead application rate .

b. Prepare the end-of period entries.

Solution

a-The overapplied balance is allocated as follows:-

Balance before allocation:

Cost of goods sold	$32000
Ending work-in-process inventory	$3500
Ending finished goods inventory	$ 4200
	$ 39700

To cost of goods sold :

$\frac{32000}{39700} \times 9200 = \$\ 7416$

To ending work-in-process inventory:

$\frac{3500}{39700} \times \$\ 9200 = 811$

To ending finished goods inventory:

$\frac{4200}{39700} \times \$\ 9200 = 973$

Total allocated = 7416 + 811 + 973 = $ 9200

b- The end of period entries:

Factory overhead applied	39700	
Overapplied factory overhead		9200
Factory overhead control		30500

Overapplied factory overhead	9200	
Cost of goods sold		7416
Work-in-process inventory		811
Finished goods inventory		973

Exercises

1- Deprecation based on the number of units produced would be classified as what type of cost?

A-out-of-pocket C-variable

B-marginal D-fixed

2- The variable factory overhead application rate under the normal , practical , and expected activity levels would be the same :

A-Except for normal volume C-Excepted for expected activity

B-Except for practical volume D-for all the activity levels

3- Cost company that the differences in product cost, resulting from the application predetermined overhead rates rather than actual overhead rates, were immaterial though actual production was substantially less than planned production . the most it explanation is that :

A-overhead was composed chiefly of variable costs

B-several products were produced simultaneously

C-fixed factory overhead was a significant cost

D-costs of overhead items were substantially higher than anticipated

4- If a predetermined overhead rate is not employed and the volume of production is increased over the level planned , the cost per unit would be expected to :

A-Decrease for fixed costs and remain unchanged for variable costs

B-Remain unchanged for fixed costs and increase for variable costs

C-Decrease for fixed costs and increase for variable costs

D-increase for fixed costs and increase for variable costs

5- The Carlo Company budgeted overhead at $ 255000for the period for department A. on the basis of a budgeted volume of 100000 direct labor hours. At the end of the period, the factory overhead control account for department A had a balance of $ 270000; actual direct labor hours were 105000. What was the over – or under applied overhead for the period?

A-$2250 over applied C-$15000over applied

B-$2250 under applied D-15000under applied

6- Factory overhead application rate best reflect anticipated fluctuation in sales over several years when the rates are computed using figures based on:

A-Maximum capacity C-practical capacity

B-Normal capacity D-Expected capacity

7- Preferable, under applied factory overhead resulting from significant unanticipated price increases should be written off by?

A-Decreasing cost of goods sold

B-Increasing cost of goods sold

C-Decreasing cost of goods sold, work-in-process inventory, and finished goods inventory

D-Increasing cost of goods sold, work-in-process inventory, and finished goods inventory

8- In order to identify costs that related to a specific product, an allocation base should be chosen that:

A-Does not have a cause and effect relationship

B-Has a cause and effect relationship

C-considers variable costs but not fixed cost

D-considers direct materials and direct labor but not factory overhead

9- The only method of allocation service department costs to producing department that considers reciprocal services is called the:

A-Direct method C-Out-of-step method

B-Step method D-Algebraic method

10- In the determination of factory overhead application rate, in numerator of the formula is the:

A-Actual factory overhead for the next period

B-Estimated factory overhead for the next period

C-Actual labor hours for the next period

D-Estimated labor hours for the next period

11- Which productive capacity level does not consider product demand, but the same time accounts for anticipated and unavailable interruption in production?

A-short-run productive capacity

B-Normal productive capacity

C-Theoretical productive capacity

D-Realistic productive capacity

12- Expected productive capacity for the current year is 175000 units. Management expected production of 208000 units of the following year. Fixed factory overhead costs are $180000. If the factory overhead application rate, under expected productivity capacity, is $2.08, what is the variable factory overhead cost per unit?

A-$ 1.03 C-$ 1.17

B-$ 1.05 D-$ 1.21

13- J & j company budget total variable overhead costs at $ 180000 for the current period. In addition, they budgeted costs for factory rent at $215000 costs for depreciation on office equipment at $ 12000, costs for office rent at $ 92000 and costs for depreciation of factory equipment at $ 38000. All these costs were based upon estimated machine hours of 80000. At the end of the period, the factory overhead control account had balance of $ 387,690. Actual machine hours were 74000, what was the over or under applied factory overhead for the period?

A-$ 12650 over applied C-$ 108,850 over applied

B-$ 12650 under applied D-$ 108,850 under applied

14- When the planned activity level used to calculate the predetermined factory overhead application rate differs from the actual level achieved for the period , the result is a :

A-Denomination variance

B-Effective variance

C-Controllable variance

D-Under application of fixed factory overhead

15- Donahue and Daughters, Inc., produced 225,000 bottles of perfume during the year. The production costs for bottles of perfume were the following:

Direct materials	$ 940,000
Direct labor	550,500
Indirect materials	348,750
Factory rent	40,000
Depreciation	33,750
Indirect labor	213,750
Factory supervisions	60,000

Each worker can produce 2500 bottles. Each supervisor can handle up to 30 workers: the supervisors are paid equal salaries. Depreciation is determined using the units of production method.

Required: determine the total factory overhead for Donahue and Daughters, Inc., if the company had produced 375000 bottles during the year.

16- The Coastin on AIR Co, estimated its levels of production as follows:

Maximum Capacity	650,750 units
Long-run Capacity	450,500 units
Short- run Capacity	370,000 units

Because of anticipated and unavoidable interruptions in production, theoretical capacity would be reduced by 85,000 units. Total fixed expenses were expected to be $ 260,000. Variable expenses were expected to be $0.85 per unit.

Required:

A. Determine the estimated factory overhead costs, using each of the following volume production:
   i. Ideal Capacity
   ii. Realistic Capacity
   iii. Normal Capacity
   iv. Expected Capacity

B. What would the factory overhead application rates be using units of production as the base for each of the four levels of productive capacity?

17- The Sullivan Manufacturing Company makes hammers that it sells to hardware stores in Karen Country, North Carolina. For year 5, the factory overhead expenses were expected to be:

Fixed	$ 100,000
Variable	125,750
Semivariable	17,000

For year 5, the company expected production to be 175,500 hammers: machine hours, 180,000: and direct labor hours 36,400. The estimated direct materials cost was predicted to be $ 265,000, and the estimated direct labor cost $ 172,460.

The actual data for January were as follows:

12,000 hammers

25,000 machine hours

5,000 direct labor hours

$ 44,020 direct materials cost

$ 18,000 direct labor cost

Required: Compute the application rates used to apply factory overhead, and determine the applied overhead during January for each of the following bases:

a- Units of production

b- Direct materials cost

c- Direct labor hours

d- Direct labor cost

e- Machine hours

18- Assume the following information for M.L.&O. corporation, year 2:

Estimated factory overhead:	
Fixed	$ 76,000
Variable	$ 6 per unit
Expected capacity	30,000 unit
Estimated direct labor hours	25,000
Estimated machine hours	20,000

The following data were supplied for the month of March, year 2:

Actual direct labor hours	2400
Actual machine hours	2200
Actual overhead	$ 25,000

M.L.& O. uses short-run capacity to estimate its factory overhead. The company uses Applied factory overhead account and over or underapplied factory overhead account. At the end of the month, the over or underapplied factory overhead account is closed to the cost of goods sold account.

Required: using the data given, prepare two sets of journal entries one using direct labor hours and the other using machine hours to apply the factory overhead to units produced. Do the following:

a. Record the applied factory overhead.
b. Record the actual factory overhead.
c. Close the applied factory overhead and factory overhead control accounts.
d. Close the over or underapplied factory account.

19- Factory overhead

	Department 1	**Department 2**	**Department 3**
Actual direct labor hours	420	550	375
Factory overhead rate per direct labor hours	$ 3.95	$ 2.10	$ 4.00
Actual factory overhead costs			
Rent on factory	$400	$ 250	$ 360
Factory supplies	233	141	220
Indirect labor	407	324	175
Fuel, factory	385	400	620
Small tools	120	80	75
Applied factory overhead in the following accounts:			
Cost of goods sold	850	705	1,000
Ending work-in-process inventory	509	250	300
Ending finished goods inventory	300	200	200

Required: using the data given, prepare journal entries for the following:

a. Record the applied factory overhead.
b. Record the actual factory overhead.
c. Close the applied factory overhead to the control account.
d. Allocate the over or underapplied factory overhead among ending work-in-process inventory, ending finished goods inventory, and cost of goods sold.

20- The Snowman Ice Company has two service departments and two production departments:

Service departments' total costs:	
Department 1, Repair	$ 14,000
Department 2, Cafeteria	11,000
Producing departments' factory overhead costs:	
Department 10, Machinery	52500
Department 11, Assembly	48000

Department	**Square Feet**	**Estimated total Labor Hours**
1, Repair	1500	3500
2, Cafeteria	1800	1200
10, Machinery	2000	2300
11, Assembly	3000	1700
Total	8300	8700

The costs of the Repair department are allocated on the basis of Square Feet. The costs of the Cafeteria department are allocated on estimated total labor hours. The producing departments use estimated direct labor hour: 1500 in department 10 and 1250 in department 11.

Required: Allocate the total costs of the service departments to the producing departments by using the following methods:

1. Direct method
2. Step method (allocate the costs of the repair shop first).
3. Algebraic method

Compute the factory overhead application rates for the two producing departments.

21- The Ippolito Company prepared the following list in order to determine the factory overhead in each department for the year 2018:

Factory Overhead Cost of Production Departments		
	H	G
Rent	$ 25,000	$ 77,000
Repairs	10,000	12,050
Fuel	35,000	42,000
Indirect labor	15,750	17,000
Indirect materials	6100	5,650
Heat and light	20250	15,120
Depreciation	9400	7,130
Miscellaneous	6000	5,050
Total	$ 127500	$ 181,000

Total Cost of Service Departments			
	U	V	W
Rent	$ 1,500	$ 1,450	$ 700
Repairs	2,300	3,000	750
Fuel	950	700	600
Indirect labor	14,500	10,000	9,750
Indirect materials	12,700	9,450	6,000
Heat and light	900	600	750
Depreciation	300	150	175
Miscellaneous	70	60	50
Total	**$ 33,220**	**$ 25,410**	**$ 18,775**

Additional data needed for allocation of factory overhead:

- Department U services G, V, and W in the ratio of 2:1:1, respectively
- Department V services Departments H, G, and U in the ratio of 4:3:2:1, respectively
- Department W services H and G in the ratio of 3:1, respectively

Required: Assume Department U is allocated first, V is second, and W is last.

a- Allocate the total costs of the service departments to the producing departments by using the following methods: Direct method, Step method, and Algebraic method

b- Determine the factory overhead application rates for the producing departments using the following bases: Department H, 100,000 direct hours: and Department G, 195,000 direct labor hours.

Chapter Six:

Marketing Costs

Chapter Six: Marketing Costs

Introduction:

The main objective of any company whether manufacturing or trading is to sell its products Therefore, the focus of analysis during this chapter is upon the selling and distribution costs (or it was known, the marketing costs). Accordingly, the marketing costs will represents all elements of costs result from roving products from the ownership of the company to the ownership of the consumer or customers. These costs are ranged between 20 to 30 per cent of sales in most products and some estimates have shown in certain cases that they ranged between 50 to 60 per cent (see, i.e. Trill et al 1965). Furthermore, the analyses, planning and controlling of these costs are very difficult. We can summarize the reasons of these difficulties a follows:

i. These costs are mostly happening outside the company.
ii. Most of these costs are created for raising the consumer's satisfaction which is difficult to be appraised.
iii. Analysis of marketing costs are cumbersome than manufacturing to the volume of sales, the direct association with goods sold, to types or further according to types of customers (wholesalers, retailers or the public), to the channels of distribution or to the type of sales.
iv. Most of marketing costs are indirect costs.
v. Marketing strategies and further, activities are not repetitive, but depend upon the nature of the market in each transaction.

According to above, the area of marketing costs provides vast scope for their analysis, and enables for the application of accurate methods of guidance and control.

Analyzing the marketing costs:

The necessity of valid and reliable analysis of marketing costs is due to the following reasons:

a) To determine the cost of selling each product.
b) To help in setting the proper price.
c) To aid in driving polices regarding the optimum size of sales and types of product to be encouraged.
d) To help in cost controlling and profit planning.
e) To help in planning a stable marketing policy both in the short and long run.

Accordingly, and due to the nature of market, one should expect that the scope of analysis here will be more difficult than that established earlier, with regard to the manufacturing costs. In addition to direct/ indirect analysis or cost volume behavior analysis, there is another analysis

according to sources of profitability, which may simply divided to types of sales, and to geographical channels of distribution.

Therefore, we will limit our text during this chapter to only analysis according to types of sales and channels of distribution. However, the problem which still exists, that most of marketing costs are indirect, and to A ermine the share of each unit's cost, an approach for apportionment of these costs between the competing products applied and this will be solved within the application of cost centers approach. In this case, one before dividing the could be amp any to a manageable cost centers, should be wise to realize whether the company is a manufacturing trading or is only a adding company.

In the case of a manufacturing/ trading company, there will be o production jobs working simultaneously. The first will include the manufacturing production, while the second will include the selling production. The method of applying the cost enters approach in this case will be difficult to be undertaken and handled for the level of this text, therefore, we decided to exclude and to focus only upon the case of the trading companies.

Steps of applying the cost centers approach upon marketing costs apportionment

According to this, the main divisions of the Marketing costs Analysis Sheet will include these broad centers:

1- **Production centers** this will represent the selling centers and will be coded No. 5 (according to the Egyptian uniform Accounting system). Under this heading code, it will include a number of major types or kinds of sales or territories.

2- **Technical service centers** y this will represent the centers, like, electricity, maintenance and the like, which offer a substantial aid to the company. This will be coded No. 6 according to the National system of Egypt. These centers are not necessary to be found in every company, and the existence depends only upon the main policy of the company.

3- **Marketing services centers:** which are essential to be found for the achievement of the main company's marketing policies and services, such as; publicity and advertisement about the whole products, stores, transport and packing and dispatch. All these services and their related costs are not only specific for a special type of sales or territory, but for all types. Therefore, these costs are indirect and should be apportioned in such a way between types of sales or territories.

After arriving at the previous divisions, the cost centers Approach can be applied in the following steps:

i. Analyzing the whole company's costs to two broad divisions:

(1) With regard to the production centers (no.5) this could be divided according to territories, to sub-centers, if selling is through various geographical areas (this will be considered and treated firstly), or it may be divided to sub-centers according to types of sales, if selling is directly happened by the main board office and this will be treated separately).

(2) Analyzing the whole company's costs to two broad classes as:

a- **Special costs** which are relating directly to a specific type of sales or territory. Examples of these types are as follows:

- Advertisement for certain type of product or to certain territory, which should be allocated directly this type or territory.
- Local transport certain between customers.
- Often marketing expenses paid for a specific type of sales.

All above items should be allocated directly to the responsible sales type or territory and be recorded in their divisions in center no. 5.

b- **Common marketing costs** for the achievement of the general marketing policy of the company. These costs cannot easily be related to a specific type of sales; therefore, they should be apportioned between the competing sales or territories. Examples of these costs are as follows:-

- Salesmen salaries.
- Advertisement.
- Packing and dispatch.
- Transport.
- Other marketing expenses.

All these items should represent and occupy a specific sub-centers in the marketing service center (no.7), and further be apportioned between the competing sales or territories as we will see later.

ii. Apportionment centers No. 7 to centers No.5, and here we should distinguish between two states:-

Firstly:- Marketing policy depends upon territories and geographical branches in selling products:-

Here, every territory will engage a specific sub-center in the production centers No.5, while centers No.7 will represent the central marketing services by the company. To determine the marketing costs per unit sold, we have to go through these steps

1) Apportionment of centers No.7 (general marketing services) to centers No. 5 (territories), according to a method of allocation and a basis of apportionment. With regard to the method of allocation which will be adopted during this chapter, we will follow the individual allocation method. This method was adopted here only for simplicity; however, other methods discussed in chapter (5) are possibly to be used also.

With regard to basis of apportionment of marketing services to territories, we suggest the following bases, as appear in table 1.

Table (1) Bases of Apportionment

Items	Basis of Apportionment
Salesmen Salaries	According to value of sales sent to each territory
Stores	Size of units sent to each territory or number of units sold in each territory
Transport	Weight of units sent to each territory, number of units sent multiplied by distance from the central office to each territory
Packing and dispatch	Size of units sent to each territory or number of units sold in each territory
Other marketing expenses	Value of sales in each territory
advertisements	Value of sales in each territory

2) After finishing the above step, we will find ourselves determined the total marketing costs in each territory. The marketing costs analysis sheet prepared for calculating the total costs of every territory should be prepared in the central accounting office of the company. Therefore, we should prepare another analysis sheet in each territory, to be prepared in the local accounting office of each region, to determine the marketing cost per unit sold, and this will be discussed in the following paragraphs.

3) In preparing the local marketing analysis sheet, we should follow these steps:

a- Production centers No. 5, should be reserved and divided to sub-centers, according to types of sales. Marketing services centers should be reserved for the share of the territory in the central marketing services, and be divided to sub-centers according to types of services received.

b- Total territory marketing costs, determined in sheet no. 1, should be divided to special costs for a special type of sales, which should be allocated directly to this type of sales and recorded in the sub-center of this type. The second division of the total costs is the share of the territory in the central marketing costs, and this should be allocated to the specific sub-centers in center No. 7.

c- Apportionment of the marketing cost centers to the sales types centers (no.5) by following the individual allocation method and by using these bases (see table 2)

d-The summation of each type of sales' cost center will give the total cost of marketing this type of sales.

e- To calculate the marketing costs recovery rates, the best recommended basis of absorption is the number of units sold.

f- An exceptional case from above process, when only one type of sales be sold in every territory, then no need to make two marketing sheets and only the first sheet will be enough. This is because, from the first sheet, which gives the total marketing cost in every territory, this total will represent in the same time, the total marketing costs for the type sold. Therefore, we can calculate the recovery rate depending upon this first sheet only.

Table (2) **Bases of Apportionment**

Items	**Basis of Apportionment**
Salesmen Salaries	Value of sales per type
Stores	Size of sales per type
Transport	Number of units sold multiplied by distance to customers per type sold.
Packing and dispatch	Size, per type of units sold
Other marketing expenses	Value of sales in each territory
advertisements	value of sales per type

Example

A leading trading company selling two types of products A and B through two territories L and M and the following are data extracted from the books of the board office and of the territories.

Item	Total	L	M
Distance (Km^2)	170	20	150
Number of units sent to territory from type (A)	5000	2000	3000
Number of units sent to territory from type (B)	7000	4000	3000
Number of units returned to the main office from type (A)	5000	-	5000
Advertising Expenses	6000	500	1000
Stores	1000	-	-
Transport	300	-	-
Packing & dispatch	1500	-	-
Sales Commission	500	300	200

Further information:

1) Size in feats for types A and B is 5 and 2 respectively.
2) Price in pounds for types A and B is 2 and 3 respectively.
3) Detailed data from the territories books appears in table (3) as follows.

Table (3)

Items	Territory L		Territory M	
	A	B	A	B
Units sold	2000	4000	2500	3000
Local advertising expenses	200	300	600	400
Sales commission	-	300	200	-
Price	2	3	2	3

Required:

1- Prepare the central marketing costs analysis sheet.
2- Prepare the local marketing analysis sheet for L and M territories.
3- Determine the marketing cost per units sold in each region and for types A and B.

Solution

Marketing costs analysis sheet

Items	total	territories		marketing		services		Basis of apportionment
		L	M	Adv	St	Tran	Pack	
Advertising	500	500	1000	4500				
Stores	1000				1000			
Transport	3500					3500		
Packing and dispatch	1500						1500	
Sales Commission	500	300	200					
Total	12500	800	1200	4500	1000	3500	1500	
Apportionment of services centers:								
Advertising	2400	2100						Sales value of units sent
Stores	517	183						Size of units sent
Transport	2074	1426						Number of units sent multiplied by distance
Packing and dispatch	717	783						Size of units sent
Total	6208	5992						

(1) Apportionment of various service centers to territories has depended upon units sent rather than units sold.

(2) General advertising by the central office was apportioned between territories L and M according to a ratio of 16000 15000 i.e., the value of units sent to both L and M territories from both A and B types).

(3) General stores costs in the central office was apportioned between territories L and M according to a ratio of 22000: 24000 (i.e., the size of units sent to both L and M territories from both A and B types).

(4) General transport cost by the central office was apportioned between territories L and M according to a ratio of 120000: 90000 (i.e. the number of units sent to both L and M territories from both A and B types, multiplied be distance from the central office to both L and M territories).

Territory L

Items	total	territories		marketing		services		Basis of apportionment
		L	M	Adv	St	Tran	Pack	
Sales Commission	300	-	300					
Advertising	2900	200	300	2400				
Stores	517				517			
Transport	2074					2074		
Packing and dispatch	717						717	
Total	6509	200	600	2400	517	2074	717	
Apportionment of services centers:								
Advertising		600	1800					Sales value of units sent
Stores		235	282					Size of units sold
Transport		691	1383					Number of units sold multiplied by distance
Packing and dispatch		326	391					Size of units sold
Total	5608	2052	4456					
Divided by the number of units sold	2000	1.11						
Marketing recovery rates	1.03	1.11						

Territory M

Items	total	Territories		Marketing		services		Basis of apportionment
		L	M	Adv	St	Tran	Pack	
Sales Commission	200	200						
Advertising	3100	600	400	2100				
Stores	483				483			
Transport	1426					1426		
Packing and dispatch	783						783	
Total	5992	800	400	2100	483	1426	783	
Apportionment of services centers:								
Advertising		750	1350					Value of Sales
Stores		281	202					Size of units sent
Transport		648	778					Number of units sold multiplied by distance
Packing and dispatch		455	328					Size of units sold
Total		2943	3058					
Divided by the number of units sold		÷ 2500	÷ 3000					
Marketing recovery rates		1.17	1.02					

Secondly: Marketing policy depends upon direct selling centrally by the board office.

This case appears clearly in cases of no branches following the control office. This accounting system for marketing costs in this case takes the following steps:

1) Dividing the production centers (no.5) to sub centers according to type of sales, while marketing services centers remain as they appear in the above method, when selling achieved through territories.
2) Allocating the specific costs to the responsible centers.
3) Apportionment of service centers costs to the production centers according to an acceptable bases (these basis are identical to those discussed in table 2.
4) The total marketing costs of each type of sales to be divided by the number of units sold as a final step to arrive at the marketing recovery rate of each type of sales.

Example:

A leading trading company working in two products A and M. Sales is directly through the main office and these are data relating to the marketing activities.

Items	A	B
Units sold	8000	10,000
Size in feats	2	3
Sales Commission	500	700
Price in EL	12	9
Cost of production per unit in EL	6	4
Gifts to customers in units	-	4500

Additional information

The general marketing costs were amount to:

EL 2000 advertising

EL 1000 Packing and Dispatch

EL 800 Storing

EL 300 Others

Required:

1. Prepare the marketing costs analysis sheet
2. Determine the cost of marketing per unit of each type of sales
3. Calculate the gross profit of each type of sales

Solution

Territory L

Items	total	Territories		Marketing		services		Basis of apportionment
		L	M	Adv	St	Tran	Pack	
Sales Commission	1200	500	700					
Gifts to customers	4500		4500					
Advertising	2000			2000				
Packing and dispatch	1000				1000			
Storing	8000					800		
others	300						300	
Total								
Apportionment of services centers:								
Advertising		1032	968					Value of Sales
Packing and dispatch		444	556					Size of units sold
Stores		356	444					Size of units sent
Others		155	145					
Total	9800	2487	7313					
Divided by the number of units sold		÷ 8000	÷ 10000					
Marketing recovery rates		0.31	0.73					

Profit and loss sheet

Items	Amount (A)	Amount (M)
Value of sales	96,000	90,000
(-) cost of production	48,000	40,000
Net	48,000	50,000
(-) marketing costs	2,487	7,313
Gross Profit	45,513	42,687

Notes:

(1) Gifts to customers was counted in money terms and considered as a part of M's marketing costs.

(2) Sales commission was considered and allocated directly to types of sales.

Exercises

1- A major trading company is selling two types of goods M and N through two territories East and West, and these are data extracted from the marketing books of the company:

Required: prepare the central and the local marketing costs analysis sheets

Items	Total	East	West
Units sent from type (M)	15,000	8,000	7000
Units sent from type (N)	12,000	6,000	6000
Distance (KM2)	6200	10	-
Advertising cost (EL)	2000		200
Storage costs	3500	-	
Packing and dispatch	3000	-	
Transport	4000	-	
Salesman salaries	-	-	

Data extracted from the marketing books of local territories:

Items	**East**		**West**	
	N	**M**	**N**	**M**
Units sold	8000	6000	7000	6000
Advertising	-	-	100	100
Size of units (in fetes)	3	4	3	4
Price	4	5	4	5

2- A company is trading in three types of pounds A_1, A_2 and A_3. Prepare the marketing cost analysis sheet for the selling of the above products, and calculate the cost per unit sold from each type.

Items	**Amount**	**Basis of apportionment**
Salesmen salaries	20,000	Direct charge
Salesmen commission	8000	Value of sales
Sales office expense	4000	Number of orders
Advertising : general	5000	Value of sales
Advertising : specific	2000	Direct charge
Packing	3000	Volume in fetes of units sold
Delivery expenses	100	Value of units sold
Warehouse expenses	1200	Volume of sold
Credit collection expenses	800	No. of orders

Date available relating to the products are as follows:

Items	A_1	A_2	A_3
Units sold	4000	5000	7000
Prices	3	2	5
No of orders	700	800	100
Percentage of specific advertising	30%	4%	30%
Volume in fetes of units sold	5	8	12
Sales salaries	6000	7000	7000

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