

chapter 3

Product Costing: Attaching Costs to Products and Services



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Learning Objectives

After studying Chapter 3, you will be able to:

- Understand why and how costs are attached to products and services.
- Describe how direct materials, direct labor, and factory overhead are costed to products.
- Explain why predetermined overhead rates are usually used for product costing.
- Calculate plant-wide and departmental factory overhead rates.
- Identify the main differences among alternative measures for the denominator in the overhead rate.
- Explain why services or products should be costed for pricing purposes by using an overhead rate computed at normal volume levels.
- Describe how to allocate service center costs so that they can be included in overhead rates of operating departments.

Chapter Outline

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What is the Cost of a Brake Job?

As a high school wrestling coach working in Florida, Greg Herman satisfied his love for automobiles by working as an auto mechanic during the summer months. He also found himself occasionally repairing friends' cars year-round. Demand for his repair expertise began to boom, so Greg used his savings as seed money for a new business, Greg's Auto Repair.

Greg started his enterprise with a firm hope of making a profit, and he has realized profits. However, times are changing. Revenues for this year have reached over \$2 million and are expected to increase in the future. Costs are, on the other hand, increasing faster than revenues. Greg does not know what his profit margins are for brake jobs, mufflers, and body work because he has no idea what it costs him to make repairs. Most of his accounting has been a "shoebox approach," in which receipts, deposit slips, and invoices go into a box. Periodically, a local CPA firm, Ginsburg & Arogeti, sends a staff accountant to sort the box's contents and prepare financial statements.

Greg needs cost information about repairs, and his accounting system does not provide it. For example, he needs to know: What does it cost to make one repair of each type? Are repair costs higher this month than last month? With profits going down, which jobs are losing profit margin? And, behind all of these questions is: How should

overhead costs be assigned to jobs? Greg needs an accounting system that will provide cost information for his current needs and for the future.

Introduction

Costs are used to accomplish an assortment of needs: to evaluate the profitability of goods and services, to aid in pricing and bidding decisions, to plan and budget operations, to evaluate performance, to control costs, and to establish inventory values for the balance sheet and cost of goods and services sold for the income statement.

This chapter discusses accounting for production costs and presents ways to identify costs with products. Accounting for direct materials and direct labor comes first. Then, accounting for factory overhead covers simple to more complex situations. Finally, we discuss how service center costs are included in product cost.

3.1 Costing of Products and Services

The production of goods and services involves resources. As mentioned in Chapter 1, the costs of these resources are typically classified as materials, labor, and factory overhead. The costs are accumulated by jobs or by departments. Then they are assigned to each unit of output (product or service) based on each unit's use of the resources. These relationships for assigning costs to products or services are depicted in Figure 3.1.

Figure 3.1 A view of cost linkage



The principles underlying product costing are applicable to manufacturing companies and service organizations. For example, a hospital may be interested in determining the cost of a specific medical treatment or the cost of outpatient care. A furniture store may wish to know the costs associated with carrying and selling a particular line of sofas. A building contractor, on the other hand, will accumulate costs by project. If a contractor is constructing a new bridge for the state, for instance, the contractor will identify and trace the costs to the bridge project. A university may be interested in the estimation, measurement, and control of a program to train mathematics teachers. A museum may want to determine the cost of a particular exhibit for a season.

Regardless of the type of organization, costs are identified as direct costs when they can be readily connected to a cost objective. Indirect costs, which cannot as easily be connected to an objective, must be allocated using some reasonable basis for allocation. Because the principles used in tracing costs are more clearly identified in a manufacturing setting, manufacturing cost methods are often adapted to a wide variety of applications.

We can categorize a manufacturing process as yielding commingled products, fabricated products, or assembled products. **Commingled products** exist when one unit cannot be distinguished from any other unit. One pound of sugar is indistinguishable from another

pound unless contained in some way. Products in this category include flour, oil, electricity, soft drinks, textiles, processed foods, and paper. **Fabricated products** involve reshaping materials through a cutting, stamping, or molding operation. Examples include tires, nuts and bolts, sugar-coated breakfast cereals, and silverware. **Assembled products** bring parts and subassemblies together for an assembly operation. Each product passes through the same assembly operations. Examples include kitchen appliances, calculators, computers, telephones, and pickup trucks.

3.2 Costing of Direct Costs

We now discuss how to determine the costs that are directly traceable to products or jobs. These costs consist of direct materials and direct labor.

Costing of Direct Materials

Materials include the raw materials, purchased parts, and purchased or subcontracted assemblies and subassemblies. **Direct materials** are those that are identified with the production of a specific product and are easily and economically traced to the product; their costs represent a significant part of the total product cost. All other materials and supplies that become part of a product or are consumed in production are called **indirect materials**, which are part of factory overhead.

The costs associated with acquiring materials and having them ready for production typically fall into five categories:

1. The acquisition cost (purchase price or production cost) of the materials.
2. In-transit charges, such as freight, insurance, storage, customs and duty charges.
3. Credits for trade discounts, cash discounts, and other discounts and allowances.
4. The costs of purchasing, receiving, inspecting, and storing activities.
5. Miscellaneous items, including income from the sale of scrap and spoiled units, obsolescence, and other inventory losses.

Categories 1 through 3 are typically included in the cost of materials, whether direct or indirect materials. Categories 4 and 5 are treated as factory overhead. We allocate those costs to products with one of the several approaches that will be discussed later in the chapter.

The document that lists all materials needed to produce one unit of each product is the bill of materials, generated by product design engineers. It lists the sequence in which the materials will enter production. Once a decision is made about the quantity of products to produce, the bill of materials is used to determine the amount of materials to be acquired.

Suppose that Julz Enterprises, a manufacturer of CD players, purchased materials on account for \$75,000. Upon receipt of the materials, we increase Materials and Accounts Payable by \$75,000 as follows:

Materials	Accounts payable
75,000	75,000

Production managers requisition from the storeroom the materials required for a specific job or product. Thus, each requisition becomes the basis for charging the cost of materials to a specific job or product. Assume that a month's requisitions at Julz Enterprises show that direct materials costing \$60,000 have been transferred from the materials inventory to production. The total of \$60,000 is moved from Materials to Work in Process. The latter account is a focal account for the entry of production costs. The costs of the three cost elements—direct materials, direct labor, and factory overhead—are funneled through this account, as will be shown later. It is, therefore, the control account for all in-process activity. The movement of materials used in production for the month is shown as:

Materials	Work in process
75,000	60,000
60,000	

The costs included in the \$60,000 are also charged to the various processing departments or jobs that used the materials. These itemizations form the subsidiary ledger for the Work in Process control account.

Costing of Direct Labor

Factory labor is the total labor cost expended for the benefit of production. **Direct labor** can be specifically identified with a product in an economically feasible manner. **Indirect labor** is not readily traced to a product. Because of the changes in the production environment in many companies and the emphasis on a just-in-time philosophy, a new term, value-added direct labor, is being used. **Value-added direct labor** changes materials into a finished product. For example, value-added direct labor fabricates parts, assembles products, and finishes products. Nonvalue-added direct labor moves, inspects, stores, examines, or otherwise handles the product without adding value to the product. For our purposes, we will generally define direct labor as value added and indirect labor as non-value added, even though the differences are not always clear.

Labor-related costs include the wages and salaries of the employees plus any additional expenditures made by an employer on behalf of an employee. These typically include bonuses, overtime premiums (i.e., the *additional* wages for overtime), shift differentials, idle time, employer's payroll taxes, and fringe benefits. These additional expenditures are usually treated as part of the factory overhead costs. Some of these expenditures cannot easily be traced to individual production orders. Others, such as overtime premiums and



Contemporary Practice 3.1

Overhead Cost Drivers in the UK

A survey of manufacturing companies in the United Kingdom reports that 23.9 percent of them allocate overhead costs based on direct labor, while 22.5 percent use machine hours to allocate overhead costs to products. Other companies use cost drivers such as materials cost, units produced, and production time (Brierly, Cowton, & Drury, 2001).

The total cost driver activity for the plant is divided into the total overhead cost to obtain an **overhead rate**. Products then are assigned overhead cost by multiplying the actual quantities of the activity by the rate calculated. Suppose that Julz Enterprises uses direct labor cost to allocate overhead. During the month in the earlier example, for which direct labor cost was \$10,000, the total overhead for the plant was \$15,000. Consequently, the overhead rate would be 150 percent of direct labor cost. During that month, the direct labor cost incurred to produce CD players amounted to \$2,700. Hence, \$4,050 ($\$2,700 \times 1.5$) of overhead cost would be allocated to the CD players.

Predetermined Overhead Rate

Thus far, we have discussed **actual costing**, where the product costs consist of actual direct materials used, actual direct labor cost, and overhead allocation based on total actual overhead costs and total actual activity. Most companies, however, use a normal cost system or a standard cost system. The latter will be covered in Chapter 7. **Normal costing** differs from actual costing in that overhead is allocated using a **predetermined overhead rate**, defined as:

Predetermined overhead rate = Budgeted factory overhead \div Budgeted cost driver activity

With normal costing, the **applied factory overhead** would be determined by multiplying the predetermined overhead rate by the actual cost driver activity for the job or product. Typically, companies use a one-year time horizon to calculate predetermined overhead rates.

Two major reasons exist for the use of normal costing rather than actual costing. The first is the timing of factory overhead cost incurrence. For example, air conditioning costs in the summer for many companies in the sunbelt tend to be higher than heating costs are in the winter. Should we allocate the higher air conditioning costs to products that were manufactured during the summer? The facilities and workers must be maintained regardless of the weather. In addition, discretionary costs may fluctuate widely from month to month. For instance, managers may decide to incur substantial maintenance costs during some months and very little during other months. Because of seasonal and discretionary aspects of overhead, a more stable overhead rate requires a longer time horizon, such as one year.

The second reason for the use of normal costing is the potential fluctuation in the activity represented by the cost driver. Most companies do not have a constant level of activity every month. For example, employees take vacations during the summer months, operations are scaled back to accommodate major repairs and maintenance, production ceases while a changeover in tooling occurs, or the company is closed for the week between Christmas and New Year's Day. Normal costing, by using a one-year time horizon for the overhead rate, averages costs over the units of work regardless of when work is performed. Therefore, a product is not penalized because it is produced during a period of low volume.

Calculating an actual overhead rate using a one-year time horizon, prices, and other cost-based decisions could not be done until the end of the year. Clearly, companies cannot operate this way. The use of a predetermined overhead rate allows costs of products and jobs to be calculated throughout the year as necessary. Moreover, a predetermined overhead rate helps managers to prepare bids on major orders or to price business from prospective customers.

To illustrate the application of overhead in a normal cost system, suppose that, for 2013, Bodker Publishing Company has budgeted \$50,000 for fixed overhead costs and \$3 per direct labor hour for variable overhead costs. This is its overhead cost function. These budgeted costs correspond to a budget activity of 10,000 direct labor hours. The predetermined overhead rate would be computed as:

$$[\$50,000 + \$3(10,000)] \div 10,000 = \$8 \text{ per direct labor hour}$$

Assume there were 10,000 direct labor hours worked, at a rate of \$10 per hour, during 2013. Assume also that \$95,000 of direct materials were used. During production, various entries were made to cost the individual jobs. We could quite literally add \$8 to Work in Process every time one more hour of direct labor is worked. In normal accounting activity, these transfers to Work in Process are done periodically, perhaps weekly or monthly. If done in aggregate, a summary transfer to Work in Process of all overhead applied to all jobs would show the following:

Factory overhead	Work in process
80,000	95,000
	100,000
	80,000

As each job goes through production, an overhead charge at the predetermined rate of \$8 for each direct labor hour is made to the job. Suppose Bodker Publishing Company published an economics textbook (Job 1018) that required \$20,000 of direct materials and 2,000 hours of direct labor at \$10 per hour. The completed cost for Job 1018 can be summarized as:

Direct materials	\$20,000
Direct labor (2,000 hours at \$10 per direct labor hour)	20,000
Factory overhead (2,000 hours at \$8 per direct labor hour)	<u>16,000</u>
Total cost	<u>\$56,000</u>

At its completion, the cost of a job is transferred from Work in Process to Finished Goods. For Job 1018, the transfer would be:

Finished goods		Work in process	
56,000		95,000	56,000
		100,000	
		80,000	

Disposition of the Overhead Variance

While the products are costed using a predetermined overhead rate and by crediting the Factory Overhead account, actual overhead costs are incurred and recorded as debits to Factory Overhead. Suppose Bodker Publishing Company incurred actual overhead costs amounting to \$81,500 during 2010. These costs included depreciation of \$11,500, expired insurance of \$10,000, salaries of \$40,000, and utilities of \$20,000. The entries to record these actual costs are:

Factory overhead		Accumulated depreciation	
81,500	80,000	11,500	
Prepaid insurance		Wages payable	
	10,000	40,000	
Utilities payable			
	20,000		

Notice that expense accounts were not debited because the above items represent product costs rather than period costs, as discussed in Chapter 1. Nonmanufacturing, or selling and administration, costs would be debited to expense accounts. Suppose Bodker Publishing Company had selling expenses of \$29,000, office rent of \$45,000, executive salaries of \$320,000, and office utilities of \$33,000. The following entries would be recorded:

Selling expenses	Accounts payable
29,000	29,000
Office rent expense	Rent payable
45,000	45,000
Salaries expense	Wages payable
320,000	40,000 320,000
Office utilities expense	Utilities payable
33,000	20,000 33,000

Since only \$80,000 of factory overhead was applied during 2013, the total actual factory overhead spent was not charged to jobs. The difference, or variance, of \$1,500 can be closed to Cost of Goods Sold at the end of the year, or, if desired, can be allocated to Cost of Goods Sold, Finished Goods, and Work in Process on the basis of their account balances. Since these variances tend to be relatively small, most companies simply close them out to Cost of Goods Sold. Using this approach, Bodker Publishing's entry to close out the variance is:

Factory overhead	Cost of goods sold
81,500	1,500
80,000	
1,500	

Notice that since we did not attach all \$81,500 of spending to our production, Cost of Goods Sold is increased by \$1,500.

If too little overhead is costed to the products, as in the above example, the variance is called **underapplied** or **underabsorbed overhead**. When this occurs, expenditures for overhead expenses exceed the amount attached to the products during the accounting period. On the other hand, if too much overhead is costed to the products, the variance is called **overapplied** or **overabsorbed overhead**. In this situation, more overhead costs are attached to the period's output than are actually spent for overhead.

Underapplied factory overhead means nothing more than the actual costs were not absorbed by the products manufactured. Underapplied overhead occurs in these situations:

1. We produced less than expected, or
2. We spent more than expected.

When overhead is overapplied, the variance is credited to (i.e., subtracted from) Cost of Goods Sold. Overapplied overhead occurs in these situations:

1. We produced more than expected, or
2. We spent less than expected.

In the Bodker Publishing Company example, 10,000 direct labor hours were worked. This was exactly the amount of activity that was budgeted. Therefore, the reason for the underapplied overhead variance was overspending. According to the company's cost function ($\$50,000 + \3 per direct labor hour), spending should have been $\$80,000$ but was actually $\$81,500$.

More detailed reasons for overhead variances are discussed in Chapter 7.

Multiple Overhead Rates

Some reasonable, causal, or beneficial relationship should exist among the costs accumulated in factory overhead accounts, the cost driver selected, and the products or services to which the costs will be allocated. Simply stated: The activity (as represented by the cost driver) is the link between the output of products or services and factory overhead spending. The implication is that more output requires more activity and, therefore, more overhead spending. For example, if a company uses direct labor hours as a cost driver, factory overhead costs should consist primarily or exclusively of costs that support direct workers. Such costs may include supervision and facilities for work places, as well as travel, training, and fringe benefits of workers.

In the examples up to this point in the chapter, we have assumed that only one cost driver is appropriate for the total factory overhead. However, diversity of products and services will often result in distorted cost allocations when only one cost driver is used. The greater the differences in products, the greater the diversity that exists in the operations. The more diverse the operations, the more likely it is that one cost driver cannot assign costs to all products fairly. In these situations, departmental overhead rates will assign costs more accurately to products than will one plant-wide overhead rate. A plant-wide factory overhead rate can only be justified for a company making few and similar products.

For an example, consider Fellman & Associates, a company that finishes furniture for local manufacturers. The furniture passes through two major activity centers that form the two departments in the process: sanding and painting. A summary of direct labor and overhead costs for each department during the last month follows:

	<u>Sanding</u>	<u>Painting</u>	<u>Total</u>
Direct labor	\$ 37,000	\$ 26,500	\$ 63,500
Overhead	74,000	79,500	153,500

Overhead is allocated to products on the basis of direct labor dollars. Dividing the overhead costs by direct labor dollars gives the following departmental and plant-wide overhead rates:

$$\text{Sanding } (\$74,000 \div \$37,000) = 200\%$$

$$\text{Painting } (\$79,500 \div \$26,500) = 300\%$$

$$\text{Plant-wide } (\$153,500 \div \$63,500) = 241.7\%$$

Using the different rates in allocating overhead costs to a job that has \$86 of Sanding direct labor and \$32 of Painting direct labor (i.e., a total labor cost of \$118) gives the following amounts:

Plant-wide overhead rate (\$118 x 241.7%)	<u>\$285.21</u>
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Departmental overhead rates:

Sanding (\$86 x 200%)	\$172.00	
Painting (\$32 x 300%)	<u>96.00</u>	<u>\$268.00</u>

The departmental rates allocate costs considering the characteristics of the product or job involved. The plant-wide rate averages all products and jobs.

For Fellman & Associates, the same cost driver was selected for each department. A more common situation is where departments have different cost drivers. For example, a Fabrication Department may use direct labor hours; a Machining Department, machine time; a Production Engineering Department, direct labor cost. As a company considers ways to trace costs to products more accurately, it will look at the production and support activities more closely and choose an appropriate cost driver to allocate the overhead costs.

Alternative Concepts of Volume

When selecting the denominator for the overhead rate, volume can be measured in one of four ways:

1. Ideal capacity.
2. Practical capacity.
3. Expected volume.
4. Normal volume.

Ideal capacity is the maximum amount of product that can be manufactured or the maximum service that can be rendered with available facilities. This is often too perfect a goal to be realized, and is generally recognized to be beyond realistic expectations. Certain interruptions and inefficiencies in production are to be expected.

Practical capacity is full utilization of facilities with allowance made for normal interruptions and inefficiencies. For example, production will be slowed or stopped at times because of breakdowns, shortages of labor and materials, or retooling. These possibilities are considered in arriving at practical plant capacity.

Expected volume is the level of operation budgeted or estimated for the current period. This may be at or below practical capacity. It is the level at which management expects to operate during the next month or year.

Normal volume is generally a balance between practical capacity and sales demand in the long run. Over a period of years, the peaks and valleys of customer demand are leveled by averaging, and the average level of plant utilization is considered to be normal volume.

It may seem, at first, that overhead per unit should be calculated at the expected level of operation for the next year. Indeed, this is the practice of most companies. However, for product pricing purposes, a better approach is to use the normal volume. Why should normal volume be used when you already know that the company may be operating below that level? After all, a rate computed at the expected level of operation will come closer to costing all of the overhead to the products, and product cost will be more in line with actual cost.

The problem with using an overhead rate based on expected, rather than normal, volume is illustrated by the following example. Assume that the normal level of operation for Cherrywood Medical Laboratory is 200,000 labor hours and that 100,000 items can be analyzed in that time. The fixed overhead for the year is budgeted at \$500,000. The normal fixed overhead per item is then \$5, computed as:

$$\frac{\text{Budgeted fixed overhead}}{\text{Items analyzed at normal volume}} = \frac{\$500,000}{100,000} = \$5 \text{ Fixed overhead per item}$$

But management expects to operate at only 100,000 labor hours next year and to analyze 50,000 items. An overhead rate at expected volume would be \$10 per item:

$$\frac{\text{Budgeted fixed overhead}}{\text{Items analyzed at normal volume}} = \frac{\$500,000}{50,000} = \$10 \text{ Fixed overhead per item}$$

If the lab plans to operate below normal volume, an overhead rate computed at the expected level of operations will result in more fixed overhead being assigned to each item. If prices are set by adding a markup to total cost, the price will be higher when fewer items are analyzed. With a higher price under competitive conditions, customers may be lost, thereby aggravating a condition when volume is already below normal.

For this reason, the objective is not necessarily to assign all overhead costs to products. The products should bear the normal overhead costs, and any unabsorbed fixed overhead should be recognized as a period expense. (Overabsorbed fixed overhead would likewise result in a reduction of period expenses.) Rather than allocating unabsorbed fixed overhead to products produced, this approach treats the costs of idle capacity as the costs of products the company did *not* produce.

3.4 Cost of Providing Services

An entity that provides services instead of tangible products may not operate with a formal cost accounting system that traces costs to jobs. Instead, all service job costs are treated as period costs and are often left in their original cost categories such as supplies expense, labor expense, depreciation expense, etc.

Nevertheless, costs will be used to measure performance by type of service and by customer groups. A hotel, for example, may provide an exercise room for its guests. The cost of supplies used exclusively for the exercise room, such as rubbing lotions and bandages, along with the salaries and wages of the room's employees, such as the manager and exercise class instructors, is identified with the exercise activities. Also, costs of special equipment used, such as depreciation and maintenance expenses, and other overhead costs increased by operating this service, will be included. These costs can be used as a basis for deciding how much must be added to a guest's bill to cover all costs and allow for profit. Also, does the amount of customer patronage justify continuance of the service? Can other features be provided at a certain cost to attract more customer attention? Properly assigning costs to the exercise room will give the manager the accounting information needed to answer these questions.

Some service organizations do have formal systems for determining costs associated with jobs. Accounting and legal services are examples where the firm may want costs accumulated by client number or case. In this situation, each client number or case becomes a job, with costs traced to the individual jobs.

In service organizations having formal job cost systems, inventory accounts such as Work in Process Services or Cost of Unbilled Work are used to reflect the cost of resources and effort that have been expended, but where the work is not yet completed for the customer. At year-end, or whenever financial statements are being prepared, the cost of uncompleted work appears in this type of inventory account rather than in an expense account because the related revenue has not yet been earned. Examples of such situations may include:

- A painting contractor is in the midst of a three-week painting job.
- An engineering firm is in the early design stage of a four-month project.
- A web page design firm has another two days of work before presenting the completed work to its client.
- A landscaping company has only partially completed its planting of shrubs and flowers.

When the work is completed, the costs are transferred to an account such as Cost of Completed Jobs or Cost of Services Provided. These accounts are analogous to Cost of Goods Sold for a manufacturing firm. Since most service firms do not have finished goods inventories, there would usually be no account analogous to Finished Goods.

3.5 A Product Costing Illustration

Summarized cost data are presented in this section for Scher Machine Company to illustrate product costing procedures using a normal costing system. Note that the entries

given are in composite form. In practice, many repetitious entries are made to record individual transactions that take place during the year. The sequential order of the cost transactions should also be considered. For example, the preparation of the budget for factory overhead and overhead rate calculations are completed before the beginning of the year. The predetermined overhead rate must be calculated from a budget of factory overhead so that products will be assigned the proper overhead cost. Only at the end of the year will the company know that 220,000 direct labor hours were used and that the actual factory overhead cost was \$1,336,200. Throughout the year, the company purchases materials and incurs labor and factory overhead costs as products are continually processed, completed, and sold. At the same time, costs are traced to the products and released as expenses when the products are sold.

Scher Machine Company transactions data for the fiscal year ended April 30, 2013, are as follows:

1. Materials purchased during the fiscal year totaled \$840,000.
2. Direct materials requisitioned for production cost \$631,400. Indirect materials costing \$47,200 were also requisitioned.
3. Factory payrolls amounted to \$1,874,000. The income taxes withheld from the employees' wages totaled \$393,400, and the deduction for FICA taxes withheld amounted to \$106,600. A distribution of the factory labor cost of \$1,874,000 shows that \$1,760,000 was direct labor while the remaining \$114,000 was indirect labor.
4. Factory overhead at the normal operating level of 250,000 direct labor hours results in an overhead rate of \$6 per direct labor hour. During the year, direct labor workers recorded 220,000 labor hours.
5. The factory overhead, in addition to the indirect materials and the indirect labor, amounted to \$1,175,000. Included in this amount is depreciation of \$120,000 and the employer's share of FICA taxes of \$106,600. The balance of the overhead was acquired through accounts payable.
6. Jobs completed and transferred to stock during the year had costs of \$2,945,200.
7. The cost of orders sold during the year was \$2,320,000.
8. The Factory Overhead account is closed to Cost of Goods Sold at the end of the fiscal year.

The transactions are entered in the accounts as follows:

1. **Purchase of materials.** (The cost of each type of materials is also entered on the individual materials inventory cards.)

Materials	Accounts payable
840,000	840,000

2. **Materials issued to production.** (Requisitions are the basis for entries reducing materials inventory, for posting direct materials costs to each job, and for posting indirect materials costs to Factory Overhead.)

Materials	
840,000	678,600

Work in process	
631,400	

Factory overhead	
47,200	

3. **Factory payrolls.** (A classification of labor time by jobs is shown on labor time tickets. These tickets are the basis for distributing direct labor costs to individual jobs and for posting indirect labor costs to the factory overhead subsidiary ledger.)

Wages payable	
	1,374,000

Employees' income taxes payable	
	393,400

FICA taxes payable	
	106,600

Work in process	
631,400	
1,760,000	

Factory overhead	
47,200	
114,000	

4. **Factory overhead applied.** (Factory overhead applied to products on direct labor hour basis is: 220,000 hours \times \$6 rate = \$1,320,000.)

Work in process	
631,400	393,400
1,760,000	
1,320,000	

Factory overhead	
47,200	1,320,000
114,000	

5. **Actual factory overhead.** (This is in addition to indirect materials and indirect labor.)

Factory overhead		Accumulated depreciation	
47,200	1,320,000		120,000
1,760,000			
1,175,000			
FICA taxes payable		Accounts payable	
	106,600		840,000
			948,400

6. **Work completed during the year and transferred to stock.** (Completed jobs are removed from the file of jobs in process and moved to the subsidiary ledger supporting finished goods inventory. Ending Work in Process is \$766,200.)

Work in process		Finished goods	
631,400	2,945,200	2,945,200	
1,760,000			
1,320,000			
766,200			

7. **The cost of goods sold.** (Deductions are recorded in the finished goods inventory ledger. Entries are also made in records supporting billings to customers for the sales. Ending Finished Goods is \$625,200.)

Finished goods		Cost of goods sold	
2,945,200	2,320,000	2,320,000	
625,200			

8. **Closing of Factory Overhead.** (Total actual overhead cost from entries in Items (2), (4), and (6), is \$1,336,200. Actual overhead amounting to \$16,200 is not absorbed as a part of the product cost. The underapplied overhead is closed to Cost of Goods Sold.)

Factory overhead		Cost of goods sold	
47,200	1,320,000	2,320,000	
114,000	16,200	16,200	
1,175,000			

3.6 Service Center Costs

Most companies have several departments or functions involved directly or indirectly in producing goods or providing services. The development of departmental overhead rates depends on the interrelationships among these different departments.

Operating departments are organizational units most closely tied to the productive effort that results in products or services to customers. In manufacturing organizations, these units are typically called **producing departments**. On the other hand, **service centers** (or **support functions**) provide supporting services that facilitate the activities of the operating departments. Often, service centers provide support services to one another. Service centers include, for example, maintenance, quality control, cafeterias, internal auditing, personnel, accounting, production planning and control, and medical facilities. Although they do not have a direct relationship to output, service center costs support operating departments, and, therefore, become part of the cost of a finished product or service. In some limited cases, a service center provides support services for operating departments as well as services for outside customers. Examples include engineering consulting, research and development, computer systems design, copying services, and laboratory work.

Service center costs are allocated to operating departments by means of a cost driver. Any one of a number of cost drivers may be appropriate for calculating a rate depending on the nature of the support activity. Examples of cost drivers that could be used are given in Figure 3.2. The allocated service center costs become part of the total overhead costs of the operating departments. Even costs that are direct materials or direct labor with respect to service centers become overhead costs when allocated to operating departments.

Figure 3.2: Cost drivers used for service centers

<i>Possible Cost Drivers for Selected Service Centers</i>	
<i>Service Center</i>	<i>Possible Cost Drivers</i>
Purchasing	Number of orders, cost of materials, line items ordered
Receiving and inspection	Cost of materials, number of units, number of orders, labor hours
Storerooms	Cost of materials, number of requisitions, number of units handled, square or cubic footage occupied
Personnel	Number of employees, labor hours, turnover of labor
Laundry	Pounds of laundry, number of items processed
Cafeteria	Number of employees
Custodial services	Square footage occupied
Repair and maintenance	Machine hours, labor hours
Medical facilities	Number of employees, hours worked
Factory administration	Total labor hours, number of employees, labor cost
Power	Kilowatt hours, capacity of machines

Occasionally, companies may not allocate service center costs to operating departments, in order to ensure that the services are fully utilized by the operating managers. Some examples of this phenomenon include internal audit departments, credit-check services, libraries, and computer services.

Three common approaches are available for allocating the costs of service centers: direct method, step (sequential) method, and reciprocal method. To illustrate the allocation of service center costs for the first two methods, we will use data from the School of Business at Hardknox University. The School of Business wishes to determine overhead costs per credit hour for its undergraduate and graduate programs. We will treat these as the two operating departments. The School of Business has three service centers: Building Services, Staff Services (e.g., secretarial support, computer support, and photocopying), and Administration. Budgeted data for the coming year appear as follows:

	<u>Square feet occupied</u>	<u>Employees</u>	<u>Overhead costs</u>
Service centers:			
Building Services	1,000	30	\$165,000
Staff Services	2,000	20	90,000
Administration	8,000	20	330,000
Operating departments:			
Graduate Program	10,000	30	265,000
Undergraduate Program	20,000	90	420,000

Building Services costs are allocated on square footage of classroom and office space. Staff Services and Administration costs are allocated based on number of employees (i.e., faculty and staff). Budgeted credit hours for the year are 20,000 for the Graduate Program and 60,000 for the Undergraduate Program.

Direct Method

Direct method allocations are made from each service center to operating departments in proportion to activity performed for each. Thus, the direct method does not assign costs to other service centers for work performed for other service centers. Allocation of service center costs uses only those cost drivers pertaining to operating departments. Once the service centers have their costs allocated, operating department overhead rates per unit of activity are calculated.

Space associated with the Graduate Program is 10,000 square feet; for the Undergraduate Program, the space used is 20,000 square feet. The allocation base, therefore, totals 30,000 square feet. Building Services costs are then prorated over the two programs as follows:

Graduate Program	10,000 sq. ft.	$1/3 \times \$165,000 =$	\$ 55,000
Undergraduate Program	<u>20,000</u>	$2/3 \times \$165,000 =$	<u>110,000</u>
Total	<u>30,000 sq. ft.</u>	Total cost	<u>\$165,000</u>

The same approach follows for Staff Services and Administration. These are summarized as follows:

Graduate Program	30 employees	$1/4 \times \$ 90,000 =$	\$22,500
Undergraduate Program	<u>90</u>	$3/4 \times \$ 90,000 =$	<u>67,500</u>
Total	<u>120 employees</u>	Total cost	<u>\$ 90,000</u>
Graduate Program	30 employees	$1/4 \times \$330,000 =$	\$ 82,500
Undergraduate Program	<u>90</u>	$3/4 \times \$330,000 =$	<u>247,500</u>
Total	<u>120 employees</u>	Total cost	<u>\$330,000</u>

Another way to perform these allocations is to divide the service center costs by the cost driver and apply the resulting rate to the operating department usage amount. For example, Building Services would have a rate of \$5.50 per square foot ($\$165,000 \div 30,000$).

The results of service center allocations and the subsequent calculation of overhead rates for the operating departments are summarized as follows:

	<u>Building Services</u>	<u>Staff Services</u>	<u>Administration</u>	<u>Graduate Program</u>	<u>Undergraduate Program</u>
Costs	\$165,000	\$90,000	\$330,000	\$265,000	\$420,000
Building Services	(165,000)			55,000	110,000
Staff Services		(90,000)		22,500	67,500
Administration			(330,000)	82,500	247,500
	<u>\$ 0</u>	<u>\$ 0</u>	<u>\$ 0</u>	\$425,000	\$845,000
Credit hours				$\div 20,000$	$\div 60,000$
Overhead rate per credit hour				<u>\$ 21.25</u>	<u>\$ 14.08</u>

Step (Sequential) Method

The **step (sequential) method** is an attempt to consider services performed for other service centers. However, recognition of those services is a one-way process. The service centers are arranged in a sequence, and their costs are allocated one after the other. Once a service center's costs are allocated, no other costs are allocated back to that service center even though it may use resources of other service centers. The first service center's costs are allocated to all subsequent service centers and operating departments. The second service center's costs are then allocated to all subsequent service centers and operating departments, but not to the first service center. This process continues until all service centers' costs have been allocated to operating departments. The number of allocation steps will equal the number of service centers.

Since there are three service centers in the Hardknox University School of Business, there are three steps in the allocation process. We begin by allocating the costs of Building Services. The square footage for Staff Services is 2,000, Administration is 8,000, Graduate Program is 10,000, and Undergraduate Program is 20,000. The allocation base, therefore, totals 40,000 square feet. Building Services costs are then prorated over the remaining service centers and operating departments, as follows:

Staff Services	2,000 sq. ft.	$5\% \times \$165,000 =$	\$8,250
Administration	8,000	$20\% \times \$165,000 =$	33,000
Graduate Program	10,000	$25\% \times \$165,000 =$	41,250
Undergraduate Program	<u>20,000</u>	$50\% \times \$165,000 =$	<u>82,500</u>
Total	<u>40,000 sq. ft.</u>	Total cost	<u>\$165,000</u>

Staff Services receives an allocation of Building Services costs. This allocation must be added to the costs already charged to the Staff Services department to determine the allocation of Staff Services costs. The new total Staff Services costs are \$98,250 (\$90,000 + \$8,250). The next step in the allocation process is as follows:

Administration	20 employees	$2/14 \times \$98,250 =$	\$14,035*
Graduate Program	30	$3/14 \times \$98,250 =$	21,054
Undergraduate Program	<u>90</u>	$9/14 \times \$98,250 =$	<u>63,161</u>
Total	<u>140 employees</u>	Total cost	<u>\$ 98,250</u>

* This figure has been rounded down.

After allocating Building Services and Staff Services costs, the Administration costs for the next step of the allocation are \$377,035 (\$330,000 + \$33,000 + \$14,035). These costs are allocated as follows:

Graduate Program	30 employees	$25\% \times \$377,035 =$	\$94,259
Undergraduate Program	<u>90</u>	$75\% \times \$377,035 =$	<u>282,776</u>
Total	<u>120 employees</u>	Total cost	<u>\$377,035</u>

The results of service center allocations and the subsequent calculation of overhead rates for the operating departments are summarized as follows:

	<u>Building Services</u>	<u>Staff Services</u>	<u>Administration</u>	<u>Graduate Program</u>	<u>Undergraduate Program</u>
Costs	\$165,000	\$90,000	\$330,000	\$265,000	\$420,000
Building Services	(165,000)	8,250	33,000	41,250	82,500
	<u>\$ 0</u>	\$98,250			
Staff Services		(98,250)	14,035	21,054	63,161
		<u>\$ 0</u>	\$377,035		
Administration			(377,035)	94,259	282,776
			<u>\$ 0</u>	\$421,563	\$848,437
Credit hours				÷ 20,000	÷ 60,000
Overhead rate per credit hour				<u>\$21.08</u>	<u>\$14.14</u>

How do you arrange the order of service centers? The general rule is to sequence service centers according to the amount of services provided to other service centers—going from greatest to least. What constitutes “greatest amount of service”? One interpretation is according to the center serving the greatest number of other service centers. Another is the amount of cost in the service center; the service center with the highest costs goes first. It is not clear which interpretation should be applied. The real issue is to set up a sequence that will provide reasonable and logical allocations.

Reciprocal Method

Neither the direct method nor the step method of service center allocation recognizes mutual rendering of services among service centers. A third method, the **reciprocal method**, does consider that service centers can perform services in a mutual fashion for each other. The method, however, is more complex than the direct and step methods because it involves solving simultaneous equations. Specifically, the number of simultaneous equations will equal the number of service centers. When this number is large, a computer becomes necessary to solve the equations. For simplicity, we will restrict our analyses to cases of two service centers.

The reciprocal method involves a two-stage procedure:

Stage 1: Set up and solve the following two equations for S_1 and S_2 :

$$S_1 = DC_1 + k_1S_2$$

$$S_2 = DC_2 + k_2S_1$$

where:

S_i = cost of service center i after the reciprocal allocation ($i = 1, 2$)

DC_i = the direct costs traceable to service center i ($i = 1, 2$)

k_1 = the percentage of S_2 cost allocated to S_1

k_2 = the percentage of S_1 cost allocated to S_2

Stage 2: Allocate the costs of each service center derived in Stage 1 (i.e., S_1 and S_2) to all other service centers and operating departments.

To illustrate, suppose Lubel Brothers, Inc. manages real estate properties for various owners. The firm has two operating departments: Indoor Malls, with directly traceable overhead costs of \$200,000 per month, and Outdoor Shopping Centers, with directly traceable overhead costs of \$320,000 per month. The departmental overhead rates are based on direct labor hours. There are also two service centers: Storerooms, having directly traceable costs of \$48,000 per month, and Custodial Services, having directly traceable costs of \$250,000 per month. Storerooms costs are allocated on the basis of number of store-room requisitions, while Custodial Services costs are allocated on the basis of number of employees. These facts are summarized in the following table:

<u>Department</u>	<u>Costs</u>	<u>Requisitions</u>	<u>Employees</u>	<u>Labor Hours</u>
Indoor Malls	\$200,000	1,000	84	13,000
Outdoor Shopping Centers	320,000	8,000	12	3,000
Storerooms	48,000	-	24	-
Custodial Services	250,000	1,000	-	-

First, we set up the two equations for Stage 1:

$$S = \$48,000 + .2C$$

$$C = \$250,000 + .1S$$

where:

S = Cost of Storerooms after the reciprocal allocation

C = Cost of Custodial Services after the reciprocal allocation

The allocation percentages were determined as follows:

$$k_1 = 24 / (24 + 12 + 84) = 24 / 120 = .2$$

$$k_2 = 1,000 / (1,000 + 8,000 + 1,000) = 1,000 / 10,000 = .1$$

Notice that the denominators for calculating the allocation percentages consist of all centers and departments other than the one from which the costs are being allocated. This is so because in Stage 2 the costs will be allocated to all other service centers and operating departments.

We now solve the two equations by first substituting the second equation into the first:

$$S = \$48,000 + .2(\$250,000 + .1S)$$

$$.98S = \$98,000$$

$$S = \$100,000$$

Now we obtain C by inserting \$100,000 into our second equation:

$$C = \$250,000 + .1(\$100,000)$$

$$C = \$260,000$$

Having solved for S and C, we proceed to Stage 2, where we allocate these costs as follows:

- (a) Of the \$100,000 from S, 10 percent (1,000/10,000) is allocated to Custodial Services, 10 percent (1,000/10,000) is also allocated to Indoor Malls, and 80 percent (8,000/10,000) is allocated to Outdoor Shopping Centers.
- (b) Of the \$260,000 from C, 20 percent (24/120) is allocated to Storerooms, 70 percent (84/120) is allocated to Indoor Malls, and 10 percent (12/120) is allocated to Outdoor Shopping Centers.

The resulting allocations, total operating department overhead costs, and departmental overhead rates are summarized in the following table:

	<u>Storerooms</u>	<u>Custodial Services</u>	<u>Indoor Malls</u>	<u>Outdoor Shopping Centers</u>
Costs	\$48,000	\$250,000	\$200,000	\$320,000
Storerooms	(100,000)	10,000	10,000	80,000
Custodial Services	<u>52,000</u>	<u>(260,000)</u>	<u>182,000</u>	<u>26,000</u>
Totals (after allocation)	<u>0</u>	<u>\$ 0</u>	<u>\$392,000</u>	<u>\$426,000</u>
Direct labor hours			13,000	3,000
Overhead rate per direct labor hour			<u>\$30.15</u>	<u>\$142.00</u>

All \$298,000 of service center costs (\$48,000 + \$250,000) have been fully allocated to the operating departments. To confirm: \$10,000 + \$80,000 + \$182,000 + \$26,000 = \$298,000.

Two other issues influence the way we allocate service center costs: treatment of revenues and allocation of costs by behavior. These issues are presented next.

Treatment of Revenues

Most service centers simply incur costs and generate no revenues. A few, such as a cafeteria, may charge employees or other outside parties for the services they perform. Any revenues generated should be offset against the service center costs. For both the direct method and the step method, we allocate the costs less the offset. In this manner, other service centers and operating departments will not be required to bear costs for which the service center has already been reimbursed.

Allocation of Costs by Behavior

Whenever possible, service center costs should be separated into variable and fixed classifications and allocated separately. As a general rule, variable costs should be charged to other service centers and operating departments on the basis of the actual activity that controls the incurrence of the cost involved. The service centers and departments directly responsible for the incurrence of servicing costs are, therefore, required to bear the cost in proportion to their actual usage of the service involved.

The fixed costs of service centers represent the cost of providing capacity. As such, these costs are most equitably allocated to consuming service centers and operating departments on the basis of predetermined amounts. In this way, the amount of costs allocated is determined in advance of the period in which service is provided. Once determined, the amount does not change from period to period. Typically, the amount allocated is based either on peak-period or long-run average servicing needs. This approach of allocating variable costs on the basis of actual activity and fixed costs using predetermined percentages is sometimes referred to as the **dual-rate method** of allocation.

The following example will illustrate undesirable consequences of not separating the allocation of fixed and variable costs. Suppose that Azer Website Designers has an Administration support center that services two operating centers: Domestic and International. Based on needs forecast by these two operating centers, Azer hired staff and incurred other fixed costs amounting to \$1,200,000 per year. Sixty percent of this cost derived from the needs of Domestic. In addition, Administration incurs costs that vary with the amount of labor hours worked in the operating centers. This averages about \$1 per hour.

In 2013, Domestic worked 400,000 hours and International worked 200,000 hours. If fixed and variable costs are not separated, the allocation rate would be determined as follows:

$$\text{Allocation rate} = \frac{\$1,200,000 + \$1(400,000 + 200,000)}{400,000 + 200,000} = \$3 \text{ per hour}$$

The 2013 allocations to each of the operating centers would be:

$$\text{Domestic: } \$3 \text{ per hour} \times 400,000 \text{ hours} = \$1,200,000$$

$$\text{International: } \$3 \text{ per hour} \times 200,000 \text{ hours} = \$600,000$$

In 2014, International works the same 200,000 hours, but Domestic's work drops off to only 100,000 hours. The allocation rate for 2014 would change as follows:

$$\text{Allocation rate} = \frac{\$1,200,000 + \$1(100,000 + 200,000)}{100,000 + 200,000} = \$5 \text{ per hour}$$

The 2014 allocations to each of the operating centers would be:

$$\text{Domestic: } \$5 \text{ per hour} \times 100,000 \text{ hours} = \$500,000$$

$$\text{International: } \$5 \text{ per hour} \times 200,000 \text{ hours} = \$1,000,000$$

Note that International's share of costs increased by \$400,000 (\$1,000,000 - \$600,000) even though it worked the same number of hours both years. Because fewer hours were worked in Domestic, the allocation rate increased. This resulted in more fixed Administration cost charged to International than in the previous year. To avoid this inequity, each year the dual-rate method would assign \$720,000 in fixed cost to Domestic (.6 × \$1,200,000) and \$480,000 to International (.4 × \$1,200,000). These allocations are in accordance with the forecasted needs that generated the total fixed cost of \$1,200,000. For the variable costs, the dual-rate method would assign \$1 per hour each year. Thus, with the dual-rate method, International would be assigned a total cost of \$680,000 each year (\$480,000 + \$200,000), while Domestic would be assigned \$1,120,000 in 2013 (\$720,000 + \$400,000) and \$820,000 in 2014 (\$720,000 + \$100,000).

3.7 Ethical Issues for Cost Allocation

Often, a department or division's performance is evaluated on the basis of profits after overhead costs have been allocated. Consequently, the choice of cost drivers can affect performance evaluation. One wishing to reward some managers and penalize others could attempt to do so by unethically selecting cost drivers that would shift overhead costs to the desired entities.

When the prices of certain services or products are cost-based while others are market-driven, managers are often tempted to shift much of the overhead costs to those cost-based services or products. This can be accomplished by:

1. Including in the overhead cost pool items which are not business expenses (e.g., entertainment expenses unrelated to the business).
2. Arbitrary selection of cost drivers.

When using the step method of allocating support costs, another way to shift overhead costs is:

3. Arbitrary ordering of support centers.

Clearly, the inclusion of nonbusiness expenses is unethical. The arbitrary selection of cost drivers or of the order of support centers is not as clear. On one hand, management has an obligation to the company's owners to maximize profits using any allowable methods. On the other hand, there is a question of fairness to the parties purchasing the products or services. Moreover, when the government happens to be the other party, the issue extends to one of fairness to taxpayers.



Contemporary Practice 3.2

Increasing Revenues by Changing Cost Allocations

An experiment with individuals in graduate and executive education managerial accounting classes, who averaged about six years of full-time work experience, tested whether they would arbitrarily change an established logically-based cost allocation procedure to one which is more arbitrary in order to increase profits. The scenario was one in which the company was selling one of its products on a cost-plus basis, and by allocating more overhead costs to this product rather than to other products, more revenues could be generated since the revenues for this cost-plus product would be based on the higher cost assigned to it. The study estimated that about 41 percent of the participants would arbitrarily change the cost allocation procedure in order to increase revenues and thereby meet a targeted pretax income figure (Schneider, 2004).

Chapter Summary

One of the objectives in cost accounting is to determine the cost to provide a given service, to manufacture a given quantity of product, or to complete some project. We accumulate the costs of materials, labor, and overhead separately. Materials are identified as direct or indirect. If direct, the materials are charged directly to the specific product. Indirect materials costs are included in factory overhead costs. Labor costs follow the same type of distinctions.

Factory overhead is budgeted and divided by a cost driver that relates overhead costs to the products. This yields a rate that is used to allocate overhead to services or products. If the overhead consists largely of labor-related costs and labor support costs, such as supervision and fringe benefit costs, the cost driver selected may be direct labor hours. The cost driver "direct labor hours" serves as a bridge between the product and the overhead costs. On the other hand, machine hours may be more appropriate if a large part of the overhead is lubrication, maintenance, and other costs generally related to machine operation. Other cost drivers may, however, be better links between costs and outputs. Both overhead costs and the cost driver should be budgeted at a normal level of operations rather than just the expected volume for the coming period. Factory overhead rates can be plant-wide or departmental, depending on the diversity of the products.

Actual costs are accumulated, and comparisons of actual and estimated costs for each product help management to control costs. Actual overhead incurred can be compared with the overhead applied to the services or products. If actual factory overhead is less than the overhead applied to products (or if overhead is overapplied), the variance is usually closed out to Cost of Goods Sold.

The overhead costs of operating departments include allocations of service center costs. The direct method allocates service center costs directly to operating departments without any intervening allocations to service centers. The step method involves a sequence

of allocations where service center costs are allocated to other service centers as well as operating departments. The reciprocal method simultaneously allocates service center costs among service centers and operating departments. Any revenues earned by service centers should be deducted from the costs allocated. Ideally, variable costs should be allocated separately from fixed costs.

Problem for Review

You find that the cost records at Oberman Printing Company have been poorly maintained. Some information has been entered, but other information is missing. Fortunately, the information given is correct.

The costs for jobs 686, 687, and 688 are to be determined. The direct materials cost is \$528 for Job 686 and \$715 for Job 687. The cost of direct materials requisitioned during the month for all other jobs, except Job 688, is \$4,820. No jobs were in process at the beginning of the month. The total cost of direct materials requisitioned during the month was \$6,913.

Labor is paid at a uniform rate of \$10 an hour. Job 686 required 82 direct labor hours, and job 688 required 43 direct labor hours. A total of 760 direct labor hours were worked during the month. The direct labor cost of all other jobs, with the exception of the three jobs being considered, was \$5,850.

Two machine hours are used for each direct labor hour. Overhead is applied at a rate of \$4 per machine hour. The actual overhead cost for the month was \$6,320. Jobs 686, 687, and 688 were completed during the month.

Questions:

1. Compute the costs for Jobs 686, 687, and 688. Show costs by cost element.
2. Determine the amount of overhead applied to all orders during the month.
3. What was the amount of the underapplied or overapplied overhead?
4. You have received a telephone call from the general manager requesting the total cost per unit on Job 686. There were 50 units (books) on this order. What is the total cost per unit?

Solution:

(1) Costs of job by cost elements:

	<u>Jobs</u>				<u>Total</u>
	<u>686</u>	<u>687</u>	<u>688</u>	<u>Other</u>	
Direct materials	\$528	\$715	\$850*	\$4,820	\$6,913
Direct labor	820	500**	430	5,850	7,600
Applied overhead	<u>656</u>	<u>400</u>	<u>344</u>	<u>4,680</u>	<u>6,080</u>
Total costs	<u>\$2,004</u>	<u>\$1,615</u>	<u>\$1,624</u>	<u>\$15,350</u>	<u>\$20,593</u>

* Direct materials on Job 688:		
Total direct materials		\$6,913
Job 686	\$528	
Job 687	715	
All other jobs	<u>4,820</u>	<u>6,063</u>
Total direct materials		<u>\$850</u>
** Direct labor costs on Job 687:		
Total direct labor costs: 760 hours × \$10		\$7,600
Job 686: 82 hours × \$10	\$820	
Job 688: 43 hours × \$10	430	
All other jobs	<u>5,850</u>	<u>7,100</u>
Total direct labor		<u>\$500</u>

- (2) Overhead rate per direct labor hour is \$8 (2 machine hours × \$4). \$8 is 80% of the \$10 per hour direct labor cost. Therefore, applied overhead is 80% of direct labor cost.

$$\text{Applied overhead} = 80\% \times \$7,600 \text{ direct labor cost} = \underline{\underline{\$6,080}}$$

- (3) Underapplied or overapplied overhead:

Applied overhead	\$6,080
Actual overhead	<u>6,320</u>
Underapplied overhead	<u>\$240</u>

- (4) Total cost per unit on Job 686:

Total costs on job	\$ 2,004
Units on job	÷ 50
Unit cost	<u>\$40.08</u>

Key Terms

actual costing A costing system in which product costs consist of actual direct materials used, actual direct labor cost, and actual overhead cost.

applied factory overhead The amount of factory overhead cost determined by the product of the predetermined overhead rate and the actual activity.

assembled products Products produced by bringing parts and subassemblies together.

commingled products Products in which one unit cannot be distinguished from any other unit.

direct labor Labor that can be specifically identified with a product in an economically feasible manner.

direct materials Materials that can be identified with the production of a specific product and are easily and economically traced to the product.

direct method A method of service center cost allocation that assigns costs only to operating departments.

dual-rate method A method of allocating fixed costs separately from variable costs.

expected volume The amount of activity that is anticipated during the coming year.

fabricated products Products that are produced by reshaping materials through a cutting, stamping, or molding operation.

ideal capacity The maximum amount of product that can be manufactured or the maximum service that can be rendered with available facilities.

indirect labor Labor that cannot be specifically identified with a product in an economically feasible manner.

indirect materials Materials that cannot be identified with the production of a specific product or are not easily and economically traced to the product.

normal costing A costing system in which product costs consist of actual direct materials used, actual direct labor cost, and applied overhead cost.

normal volume An average level of plant utilization over several years.

operating departments Organizational units most closely tied to the productive effort that results in products or services to customers.

overabsorbed overhead Applied overhead that is greater than the actual amount incurred.

overapplied overhead Applied overhead that is greater than the actual amount incurred.

overhead rate Total overhead cost divided by total cost driver activity.

practical capacity Full utilization of facilities with allowance made for normal interruptions and inefficiencies.

predetermined overhead rate An overhead rate developed at the beginning of the year based on estimated costs and estimated activity.

producing departments Operating departments in manufacturing organizations.

reciprocal method A method of assigning service center costs that recognizes mutual services among service centers.

service centers Organizational units that provide supporting services that facilitate the activities of the operating departments.

step (sequential) method A method of assigning service center costs that recognizes services provided to other service centers, but only in a one-directional manner.

support functions Organizational units that provide supporting services that facilitate the activities of the operating departments.

T-account Represents the company's Factory Overhead account activity for the year.

underabsorbed overhead Applied overhead that is less than the actual amount incurred.

underapplied overhead Applied overhead that is less than the actual amount incurred.

value-added direct labor Labor that changes materials into a finished product.

Questions for Review and Discussion

1. Explain the distinction between direct and indirect costs.
2. What is the difference between a fabricated product and an assembled product?
3. What is a bill of materials? Why is it important to the acquisition of materials?
4. What are the three criteria for determining whether materials are direct or indirect?
5. Explain why a budget is used in costing factory overhead, rather than assigning actual overhead cost after the end of the year.
6. What account is credited when factory overhead is added to work in process?
7. Explain under what circumstances departmental rates are preferred to a plant-wide factory overhead rate.
8. Explain the difference between practical capacity and normal volume.
9. What is the difference between a service center and an operating department?
10. How are service center costs allocated to other service centers and operating departments under the direct method? Under the step method?
11. Why is the reciprocal method for service center allocation more justifiable than the step method or direct method?

Exercises

- 3-1. Cost of Orders.** Hotz Repair Services specializes in the routine maintenance and repair of power lawn mowers and other small machines. Three orders (#721, #722, and #723) were started and completed in March. Materials costing \$41 were used on order #721; materials costing \$17 were used on order #722; and materials costing \$8 were used on order #723. Labor is paid at a uniform rate of \$8.50 per hour, and overhead is applied at 80 percent of labor cost. During the month, 3 labor hours were used for order #721, 2 hours for order #722, and 4 hours for order #723.

Question:

Compute the costs of each order, showing separately the costs of materials, labor, and overhead.

- 3-2. Overtime and Late-Shift Labor Costs.** H & L Solomon Computer Supplies operates its stores on a two-shift basis and pays a late-shift differential of 15 percent above the regular wage rate of \$18 per hour. The company also pays a premium of 50 percent for overtime work. During the year, work occurred in the following categories:

Number of hours worked during the regular shift	10,000
Number of overtime hours for regular shift workers	300
Number of hours worked during the late shift	6,000

Questions:

1. Compute the total cost to assign to direct labor.
 2. Compute the amount of labor-related cost to assign to overhead.
- 3-3. Cost of Jobs.** David Greene's Muffler Shop ("No appointment necessary—we'll hear you coming") uses a normal costing system. Overhead and labor hours were estimated at \$42,000 and 6,000 hours, respectively, for 2013. During July 2013, only forty jobs were finished. Materials used on these jobs totaled \$3,700 and labor costs were \$2,700 (at \$20 per hour). During 2013, 5,000 labor hours were worked and \$38,000 in overhead costs were incurred.

Question:

1. What is the total cost of the jobs finished during July?
- 3-4. Factory Overhead Account Analysis.** Blatt Company had estimated overhead costs of \$400,000 fixed and \$600,000 variable for 200,000 units it planned to produce this year. The following **T-account** represents the company's Factory Overhead account activity for the year:

Factory overhead	
\$1,125,000	\$1,200,000

Questions:

1. What was the company's estimated cost function?
 2. How many units were produced this year?
 3. How much factory overhead was added to work in process?
 4. Was overhead underapplied or overapplied? By how much?
- 3-5. Actual and Applied Overhead.** Paley Library of Alpert County applies overhead on the basis of direct labor hours. Budget and actual data for direct labor and overhead for the year are as follows:

	<u>Budget</u>	<u>Actual</u>
Direct labor hours	500,000	537,000
Overhead costs	\$750,000	\$795,000

Question:

Determine the amount of underapplied or overapplied overhead for the year.

- 3-6. Determination of Direct Labor Cost.** Ovadia Company, an Israeli wholesaler of olive wood products, uses a predetermined overhead application rate based on direct labor cost. For the year, Ovadia's budgeted overhead was 900,000 shekels, based on a volume of 50,000 direct labor hours and a budgeted wage rate of 9 shekels per hour. Actual overhead amounted to 963,000 shekels. For the year, the overapplied overhead was 33,000 shekels.

Question:

Compute the amount of actual direct labor cost for the year.

- 3-7. Use of T-Accounts.** The Repair Department of Rogin's Gadget Heaven, a consumer electronics store, uses a normal costing system. The following transactions took place during the year:
- (a) Purchased raw materials (direct and indirect) on credit for \$55,000.
 - (b) Used \$37,000 of direct materials and \$11,000 of indirect materials.
 - (c) Applied \$42,000 of overhead.
 - (d) Jobs finished had a total cost of \$275,000.
 - (e) Overapplied overhead of \$3,000 is closed out to Cost of Jobs Delivered.

Question:

Provide entries in T-account form for the Repair Department's transactions during the year.

- 3-8. Normal Cost Computation.** Evan's Ice Cream Shoppe uses a normal costing system. During April, transactions included the following items:

Direct labor cost	\$17,000
Actual overhead incurred	45,000
Overhead applied	41,000
Direct materials used	37,000
Indirect materials used	2,500

Needless to say, there were no work in process inventories.

Question:

Compute the cost of goods completed (and sold) during April.

- 3-9. Analysis of Work in Process.** Gelfond's Book Bindery uses a predetermined overhead rate based on labor cost. The following T-account summarizes January 2013 activity relating to work in process:

Work in process inventory			
1/1/13 Balance	30,000	1/31/13 Jobs completed	120,000
Materials used	50,000		
Labor cost	60,000		
Overhead applied	40,000		
1/31/13 Balance	60,000		

Question:

If jobs in the work in process inventory on 1/31/13 contain \$10,000 of materials, how much labor cost is in the work in process inventory on 1/31/13?

- 3-10. Divisional and Facility-wide Overhead Rates.** Volova Research Laboratories performs contract research for government and commercial applications. It is located in the Salt Lake Valley where it has access to a labor market with advanced scientific and engineering degrees. Utah has several major universities graduating people who want to pursue careers while remaining in Utah. The company is divided into six divisions with appropriate support and ancillary facilities. Each division is housed in its own building within the industrial complex.

The company bills its customers based on costs of research work. Costs included are for direct equipment, direct labor hours, and overhead. The current overhead rate used for billing purposes is the facility-wide rate which is \$31.25 per hour for this year. The overhead costs and labor hours by division are as follows:

	<u>Overhead (in thousands)</u>	<u>Labor hours (in thousands)</u>
Thermal	\$ 3,760	160
Solar	13,120	800
Aquatic	2,975	170
Laser	113,400	2,250
Gases	16,471	910
Mechanical	37,290	1,695
Totals	\$187,016	5,985

Several customers, particularly government agencies, question the overhead rate because it is too high for their projects.

Questions:

1. Calculate overhead rates for the overall facility and for each of the six divisions.
2. Show how much overhead would be charged to each of the following projects with a facility-wide overhead rate and then with divisional rates:
 - (a) Project #10106: *Soil Conservation of Semi-Arid Lands*. (Funded by the U.S. Department of the Interior.) During the year, this project had 31,400 hours of work recorded. Sixty percent of those hours were from the Thermal Division, and 40 percent were from the Solar Division.
 - (b) Project #10111: *Coal Gasification Project*. (Funded 30 percent by the State of Utah, 50 percent by the U.S. Department of Energy, and 20 percent by a private utilities company.) This project absorbed 47,500 hours, of which 23,200 were in the Laser Division and the remaining hours in the Mechanical Division.
3. Which of these two project sponsor groups would have a more legitimate complaint about the overhead rate? Explain.

3-11. Direct Method and Dual-Rate Allocation. Karon Realty Company has three operating departments (Commercial Real Estate, Residential Real Estate, Apartment Location Service) and two service departments (Administration, Personnel). The budgeted data for the year are as follows:

	<u>Overhead cost</u>	<u>Labor hours</u>	<u>Number of clients</u>	<u>Employees</u>
Service departments:				
Administration	\$55,000	12,000		22
Personnel	38,000	8,000		10
Operating departments:				
Commercial Real Estate	250,000	35,000	200	60
Residential Real Estate	580,000	60,000	750	125
Apt. Location Service	330,000	40,000	275	90

Administration costs are allocated based on labor hours, and the Personnel allocation is based on number of employees. Sixty percent of the Administration costs are fixed; the long-run needs of each of the operating departments were considered as being equal when these costs were incurred. The overhead rates in each operating department are based on the number of clients.

Question:

Using the direct method in conjunction with dual-rate allocation, allocate the service departments' costs to the operating departments, and calculate overhead rates for each operating department.

- 3-12. Direct and Step Method Allocations.** Carl Lee & Sons, a small securities brokerage firm, has two operating departments relating to types of clients: Individual and Corporate. The firm also has two service departments: Research and Secretarial. Estimated direct costs and percentages of services used by other departments are as follows:

<u>Service dept.</u>	<u>Used by department</u>			
	<u>Research</u>	<u>Secretarial</u>	<u>Individual</u>	<u>Corporate</u>
Research	—	10%	40%	50%
Secretarial	20%	—	50%	30%
Direct costs	\$520,000	\$440,000	\$950,000	\$990,000

Questions:

1. Allocate the service departments' costs to the operating departments, using the direct method.
 2. Allocate the service departments' costs to the operating departments, using the step method. Allocate Secretarial costs before Research costs.
- 3-13. Reciprocal Method and Overhead Rates.** Manheim County Amusement Park has two operating centers: Rides & Games (R&G) and Concessions. In addition, there are two support centers: Human Resources (H.R.) and Maintenance. The following data have been obtained:

	<u>H. R.</u>	<u>Maintenance</u>	<u>R&G</u>	<u>Concessions</u>
Overhead costs before allocation	\$60,000	\$80,000	\$70,000	\$25,000
Proportions of service by H.R.	—	30%	50%	20%
Proportions of service by Maintenance	10%	—	60%	30%
Labor hours worked	5,500	5,900	6,400	5,000

Question:

Use the reciprocal method to compute overhead rates for R&G and Concessions.

- 3-14. Direct, Step, and Reciprocal Methods.** Beeber Airlines has two operating departments (Freight and Passenger) and two service centers (Maintenance and Administration). The following table shows June data:

	<u>Service centers</u>		<u>Operating departments</u>	
	<u>Maintenance</u>	<u>Administration</u>	<u>Freight</u>	<u>Passenger</u>
Costs	\$630,000	\$950,000	\$1,800,500	\$5,260,470
Labor hours	8,000	9,000	30,000	51,000
Number of employees	40	50	80	200

Maintenance costs are allocated using labor hours, while Administration costs are allocated using number of employees.

Questions:

1. Using the direct method, determine the total costs of the operating departments.
2. Using the step method with Maintenance costs allocated first, determine the total costs of the operating departments.
3. Using the reciprocal method, determine the total costs of the operating departments.

Problems

- 3-15. Costs of Individual Orders.** During August, Marmarosher Machine Company started production orders 116, 117, and 118. Order 115 was in process at the beginning of the month with direct materials costs of \$35,000, direct labor costs of \$21,000, and applied factory overhead of \$25,200. During the month, direct materials were requisitioned, and direct labor was identified with the orders as follows:

<u>Order no.</u>	<u>Direct materials</u>	<u>Direct labor</u>
115	—	\$26,000
116	\$39,000	45,000
117	53,000	47,000
118	47,000	16,000

Factory overhead is applied to the orders at 120 percent of direct labor cost. Orders 115, 116, and 117 were completed and sold in August. Order 118 was incomplete on August 31.

Questions:

1. Determine the costs of each order by cost element.
 2. What was the total cost of direct materials requisitioned in August and charged to Work in Process?
 3. Determine the cost of goods sold in August.
 4. What was the Work in Process balance on August 31?
- 3-16. Closing the Overhead Account.** The service department of Collomb's Auto Dealership has underapplied overhead of \$222,000 for the year. Before closing the appropriate accounts, ending balances for several accounts were as follows:

Revenues	\$12,860,000
Cost of jobs delivered	8,125,000
Finished jobs on hand	1,230,000
Work in process	1,888,000
Materials inventory	1,035,000

Question:

On the income statement, what amount should be reported for Cost of Jobs Delivered? Provide answers for both of the acceptable alternatives of closing out the underapplied overhead.

3-17. Recording Transactions. A summary of manufacturing cost transactions for Sternbach Motors, Inc. for the year is as follows:

- (a) Materials costing \$995,650 were purchased from suppliers on account.
- (b) Materials were requisitioned during the year as follows:
 - Direct materials \$791,000
 - Indirect materials (factory overhead) 147,000Included were direct materials requisitions of \$21,000 for Order 115.
- (c) The factory payroll for the year amounted to \$488,000. FICA taxes withheld was \$33,000; income taxes withheld was \$87,000; and the amount paid to the employees was \$368,000.
- (d) The factory labor was utilized as follows:
 - Direct labor \$338,000
 - Indirect labor (factory overhead) 150,000Included in the direct labor cost was \$22,500, identified by labor time tickets with Order 115.
- (e) Factory overhead was applied to production at 150 percent of the direct labor cost.
- (f) Factory overhead cost during the year, in addition to the cost of indirect materials and indirect labor previously mentioned, amounted to \$173,000. Included in this amount was depreciation of \$52,000. Credit the balance of this cost to Accounts Payable.
- (g) Orders costing \$1,117,000 were completed during the year. Order 115 is included among the completed orders.
- (h) Goods costing \$944,000 were sold to customers on credit terms for \$1,552,000.

Questions:

1. Record transactions (a) through (h) using T-accounts, and close the factory overhead variance to Cost of Goods Sold.
 2. Compute the total cost and cost per unit of Order 115 assuming that 15,000 units were produced for that order.
- 3-18. Cost of Work Performed and Completed.** Perry Brickman owns and operates Bobo Heating Service. Two overhead rates are used in applying overhead costs to the jobs. One rate is based on direct labor hours, and the other is based on machine hours. The machine is a backhoe used in digging service lines. Overhead

costs of operating the backhoe are kept separately, so that only the jobs requiring the use of the backhoe are charged an overhead rate per machine hour. For the year, \$126,000 of general overhead costs were budgeted for 6,000 direct labor hours, and \$21,600 of backhoe-related overhead costs were budgeted for 1,800 machine hours (hours of backhoe operation).

On February 1, the cost in Work in Process is \$440 and consists of only one job, the job for A. Esral. Costs and other data pertaining to jobs worked on during February are:

	<u>Direct materials</u>	<u>Direct labor</u>	<u>Labor hours</u>	<u>Machine hours</u>
A. Esral	\$ 135	\$ 320	16	-
D. Appelrouth	246	560	28	-
M. Spector	230	365	12	5
S. Vogel	84	60	3	-
All other jobs	842	14,000	500	160
Totals	<u>\$1,537</u>	<u>\$15,305</u>	<u>559</u>	<u>165</u>

All orders were finished during February with the exception of the Vogel order, which is still in process.

Questions:

1. Compute an overhead rate per direct labor hour and an overhead rate per machine hour.
2. Prepare a summary of costs incurred for work performed in February.
3. Determine the cost of work completed during February.

3-19. Departmental and Plant-Wide Rates. Sloman Products, Inc. has one division that makes rollers for printing presses. The rollers vary in size from 1/4 inch to 8 inches in diameter. Fabrication and Finishing are the two departments within this division. The company uses machine hours as the base for allocating factory overhead costs to products. The budgeted data for the two departments for the coming year are:

	<u>Fabrication</u>	<u>Finishing</u>	<u>Totals</u>
Machine hours	90,000	30,000	120,000
Overhead costs	\$2,232,000	\$252,600	\$2,484,600

The machine hours for a batch of 100 units for two different products are given as:

	<u>Fabrication</u>	<u>Finishing</u>	<u>Totals</u>
1/2" roller.....	4	8	12
6-1/2" roller	9	6	15

The prime costs per batch for these two products are:

	<u>1/2" Roller</u>	<u>6-1/2" Roller</u>
Direct materials:		
Fabrication.....	\$ 18.90	\$ 33.40
Finishing.....	9.70	11.50
Direct labor:		
Fabrication.....	48.10	187.30
Finishing.....	<u>37.80</u>	<u>32.20</u>
Total prime costs.....	<u>\$114.50</u>	<u>\$264.40</u>

Questions:

1. Compute the departmental overhead rates for Fabrication and Finishing using machine hours as the cost driver.
 2. Compute a plant-wide overhead rate using machine hours as the cost driver.
 3. Compute the overhead cost per batch of product assuming:
 - (a) The plant-wide rate.
 - (b) The departmental rates.
 4. Is the total cost *per unit of each product* distorted by using a plant-wide rate instead of departmental rates? Explain with supporting computations.
- 3-20. Step Method with Revenues.** Chaiken Co. has two operating departments (Fabrication and Assembly) and two service centers (Maintenance and Public Relations). Maintenance costs are allocated based on square footage and Public Relations costs are allocated based on number of employees. Data for December are as follows:

	<u>Fabrication</u>	<u>Assembly</u>	<u>Maintenance</u>	<u>Public Relations</u>
Materials	\$8,500	\$8,900	\$4,200	\$5,500
Labor	6,500	8,400	3,300	3,900
Overhead	<u>5,100</u>	<u>1,800</u>	<u>2,500</u>	<u>3,700</u>
Totals	\$20,100	\$19,100	\$10,000	\$13,100

In addition to these costs, Public Relations generated revenues of \$705. Other data are:

	<u>Fabrication</u>	<u>Assembly</u>	<u>Maintenance</u>	<u>Public Relations</u>
Number of employees	37	44	22	30
Square footage	2,800	3,700	2,000	1,400

Question:

Using the step method, determine the total overhead costs of each operating department after allocation of service center costs. Begin the allocation with Maintenance.

- 3-21. Support Function Allocation – Direct and Step Methods.** Slovin Women’s Clothing of Manchester, England, specializes in designer skirts, which it manufactures to customer order. The budgeted data for its main plant are:

	<u>Support Functions</u>		<u>Producing Departments</u>	
	<u>Administration</u>	<u>Maintenance</u>	<u>Cutting</u>	<u>Sewing</u>
Overhead cost	£80,000	£30,000	£500,000	£600,000
Labor hours		10,000	50,000	80,000
Machine hours			100,000	150,000
Square meters of space occupied	4,500	7,000	50,000	25,000

During the year, Fier Co. placed an order that was started and completed by year-end. Data for this job include the following information:

	<u>Cutting</u>	<u>Sewing</u>
Direct materials cost	£95,000	£21,000
Direct labor hours	7,000	15,000
Direct labor cost	£56,000	£120,000
Machine hours	16,000	30,000

Question:

Treat each of the following requirements independently:

- The company follows a policy of applying overhead for the entire plant on the basis of machine hours.
 - Calculate a plant-wide overhead rate based on machine hours.
 - Apply overhead to the Fier job.
- The company follows a policy of allocating support function costs to the producing departments using the direct method. Administration costs are allocated on direct labor hours; Maintenance on square meters of space occupied; Cutting on machine hours; and Sewing on direct labor hours.
 - Allocate support function costs to producing departments.
 - Calculate overhead rates for producing departments.
 - Apply overhead to the Fier job.
- The company follows a policy of allocating support functions’ costs to the producing departments using the step method. Administration costs are allocated first using direct labor hours; Maintenance using square meters of space occupied; Cutting using machine hours; and Sewing using direct labor hours.
 - Allocate support functions’ costs to producing departments.
 - Calculate overhead rates for producing departments.
 - Apply overhead to the Fier job.
- Prepare a summary of the results of allocating overhead to the Fier job in each of the three alternatives. Explain why the differences in overhead costs occur.

3-22. Reciprocal Method and Revenues. Unterberger's Health Club is organized into two operating departments: Programming & Classes and Individual Fitness. There are also two service centers: Janitorial and Cafeteria. Janitorial costs are allocated based on square footage, while Cafeteria costs are allocated based on number of employees. The costs traceable to the operating and service centers during the year were as follows:

	<u>Service centers</u>		<u>Operating departments</u>	
	<u>Janitorial</u>	<u>Cafeteria</u>	<u>Programming & Classes</u>	<u>Individual Fitness</u>
Materials	\$10,000	\$200,000	\$8,000	\$5,000
Labor	100,000	300,000	265,000	150,000
Overhead	20,000	40,000	75,000	90,000
Totals	<u>\$130,000</u>	<u>\$540,000</u>	<u>\$348,000</u>	<u>\$245,000</u>

In addition to the above costs, the Cafeteria generated revenues of \$480,000. Other data are as follows:

	<u>Service centers</u>		<u>Operating departments</u>	
	<u>Janitorial</u>	<u>Cafeteria</u>	<u>Programming & Classes</u>	<u>Individual Fitness</u>
Square footage	1,600	8,000	24,000	32,000
Number of employees	5	14	19	6

Question:

Compute the total overhead costs for each operating department after allocation of service centers' costs. Use the reciprocal method to allocate the service centers' costs.

Case: Birnbrey & Bogart Legal Services

Birnbrey & Bogart Legal Services is a large law office in St. Louis. It is organized into three operating departments: Criminal, Civil, and Personal & Family Services. Support functions include a secretarial pool and a research center. An administrative function is responsible for managing the entire company. Birnbrey & Bogart follows the practice of allocating support functions to the three operating departments in order to establish a cost-based charge for pricing the various legal services to clients. Administrative costs are not allocated. (They are treated as period costs in the income statement.) But they are recovered through the profit margin developed as a percentage of all other costs. *(continued)*

Case: Birnbrey & Bogart Legal Services (continued)

Budgeting for the upcoming fiscal year has resulted in the following costs charged directly to all functions and departments:

	<u>Secretarial</u>	<u>Research</u>	<u>Criminal</u>	<u>Civil</u>	<u>Personal & Family</u>
Salaries and wages	\$80,000	\$120,000	\$300,000	\$400,000	\$100,000
Fringe benefits	5,600	11,200	30,000	40,000	10,000
Depreciation	8,000	16,000	24,000	32,000	8,000
Supplies	16,000	3,200	4,500	6,000	1,500

The indirect costs that are prorated to administration, support functions, and operating departments are of four varieties: insurance, leasing, utilities, and janitorial services. The following means are used to prorate indirect costs:

- (a) Insurance costs (\$160,000) are for malpractice coverage and for equipment, fixtures, and furniture. The premium (\$36,000) representing coverage on equipment, fixtures, and furniture is prorated on the basis of book value. The remainder of the \$160,000 is for malpractice. Since malpractice relates to people, the proration is based on the number of people in each department.
- (b) Leasing costs (\$96,000) are incurred for the office space occupied by the firm. Therefore, these costs are prorated based on square footage occupied.
- (c) Utilities costs (\$60,000) are for heat, light, and water. They are prorated on the basis of square footage occupied.
- (d) Janitorial services (\$36,000) to keep the offices clean are contracted out. These costs are prorated on square footage.

In allocating the support functions to the operating departments, Secretarial is allocated on the basis of secretarial time. The Research Center is allocated on the basis of salaries and wages. Overhead rates for the operating departments are determined by using salaries and wages in the Criminal and Civil Departments, and staff time in Personal & Family Services. The following budgeted data are available for the allocation bases:

	<u>Administration</u>	<u>Secretarial</u>	<u>Research</u>	<u>Criminal</u>	<u>Civil</u>	<u>Personal & Family</u>
Number of people	2	4	6	4	6	2
Book values	\$10,000	\$70,000	\$80,000	\$120,000	\$160,000	\$40,000
Square footage	1,000	2,000	2,000	1,500	2,500	1,000
Staff time (hours)	4,000	8,500	12,500	9,000	12,500	5,000
Secretarial time (hours)	500	200	2,000	2,000	3,000	1,000

(continued)

Case: Birnbrey & Bogart Legal Services (continued)

Questions:

1. Complete the proration of indirect costs to all support functions and operating departments. Show the sum of direct and indirect costs in each function and department.
2. Explain why the proration of indirect costs is necessary.
3. Using the direct method, allocate the service functions' costs to the operating departments, and develop the overhead rates for each of the operating departments. (Round dollar allocations to the nearest dollar and overhead rates to four decimal places.)
4. Using the step method, allocate the service functions' costs to the operating departments, and develop the overhead rates for each of the operating departments. The secretarial pool is allocated first. (Round dollar allocations to the nearest dollar and overhead rates to four decimal places.)
5. Compare the answers in Part (3) and Part (4) and explain why the differences occurred. Is the direct method used in Part (3) or the step method used in Part (4) preferred? Why?