

CHAPTER

3

LEARNING OBJECTIVES

After studying Chapter 3, you should be able to:

1. Distinguish between process costing and job-order costing and identify companies that would use each costing method.
2. Identify the documents used in a job-order costing system.
3. Compute predetermined overhead rates and explain why estimated overhead costs (rather than actual overhead costs) are used in the costing process.
4. Record the journal entries that reflect the flow of costs in a job-order costing system.
5. Apply overhead cost to Work in Process using a predetermined overhead rate.
6. Prepare schedules of cost of goods manufactured and cost of goods sold.
7. Compute under- or overapplied overhead cost and prepare the journal entry to close the balance in Manufacturing Overhead to the appropriate accounts.
8. (Appendix 3A) Explain the implications of basing the predetermined overhead rate on activity at capacity rather than on estimated activity for the period.

SYSTEMS DESIGN: JOB-ORDER COSTING

OVERAPPLIED/UNDERAPPLIED



Cris Griffiths Guitar Works of Saint Johns, Newfoundland, focuses on repair work and building custom guitars. Late one night while disassembling yet another guitar, Griffiths had a vision of a single bracing piece instead of the three-dozen separate internal reinforcements acoustic guitars typically have. "It was a simple idea that was easy to flesh out, but

turning it from an idea into a corporation was a pretty lengthy process," he recalls. "I often say it took me six minutes to come up with the idea and six years to make it work."

Part of the problem was that using wood to make a one-piece brace was pretty much out of the question. It would take years to whittle down a wood block into a single piece, but Griffiths realized a composite material that could be punched out using injection-molding equipment could perform the same trick. Again, simple enough to conceive but it took three years before he had a solid business plan he could present to investors. Even then, Griffiths didn't have the \$100,000 he needed to build a prototype, so he leveraged his existing business to the hilt, effectively putting the future of both companies on the line. Eventually, he convinced investors to pony up some seed money and hit the road. At a Los Angeles trade show in early 2000, his guitar—lo and behold—was a hit, attracting lineups of people wanting to check out the new star.

Production started in mid-2001 and roughly \$6 million pumped into the business over the next three years to keep it rolling. In 2003 the company switched to a lean manufacturing operation called the **Toyota** production system. That has meant a 50% cut in labour costs and manufacturing space as well as a 70% reduction in work-in-progress inventory.

Source: Andy Holloway, "Between the Rock and a Hard Place," *Canadian Business*, Dec. 27, 2004–Jan. 16, 2005, vol. 78, Iss. 1, p. 69.

As discussed in Chapter 2, product costing is the process of assigning costs to the products and services provided by a company. An understanding of this costing process is vital to managers, because the way in which a product or service is costed can have a substantial impact on reported net income, as well as on key management decisions.

The essential purpose of any managerial costing system should be to provide cost data to help managers plan, control, direct, and make decisions. Nevertheless, external financial reporting and tax reporting requirements often heavily influence how costs are accumulated and summarized in managerial reports. This is true of product costing.

In this chapter and in Chapter 4, we use an *absorption costing* approach to determine product costs. This was also the method that was used in Chapter 2. In **absorption costing**, all manufacturing costs, fixed and variable, are assigned to units of product—units are said to *fully absorb manufacturing costs*. The absorption costing approach is also known as the **full cost** approach. Later, in Chapter 7, we look at product costing from a different point of view called *variable costing*, which is often advocated as an alternative to absorption costing. Chapter 7 also discusses the strengths and weaknesses of the two approaches.

While studying product costing, we must keep in mind that the essential purpose of any costing system is to accumulate costs for managerial use. A costing system is not an end in itself. Rather, it is a managerial tool in that it exists to provide managers with the cost data needed to direct the affairs of organizations.

The design of the costing system depends on cost/benefit trade-offs as assessed by managers. The level of detail and sophistication in a cost accounting system will influence its costs of development and operation. Relevance to management and external regulatory requirements will be the benefit. Usually, more sophistication yields more benefit by providing more relevant information. But when the additional cost of providing added sophistication equals the benefits from the added relevance, the system's designer is at an optimal point in the cost/benefit trade-off and thus the added sophistication should stop.

The nature of systems design is also influenced by the nature of what is to be costed. The explanation provided in the pages that follow will focus on the nature of what is costed rather than the cost/benefit trade-offs. This will enable a description of what physically needs to be considered when the cost/benefit decision must be made. In other words, physical characteristics represent a fundamental consideration to the higher level and more subjective cost/benefit trade-off.

Absorption costing is a popular approach for determining the cost of goods sold and inventories for financial accounting and income taxes. These requirements influence how management determines costs because it may be easier and less expensive for the organization to use a single method of costing for both external and internal purposes.

Costing of products or services represents an approach that focuses on the costing of the efforts that make up the goods or services that are sold by the organization. This emphasis on costing products or services is one of the three common approaches used in managerial accounting. The discussion of costing begins with this focus because of its long tradition and its continued popularity for many types of organizations. After this approach to costing is thoroughly explored in the next few chapters, the alternatives will be studied so that a more complete picture will be available for your study of managerial accounting.

Absorption costing

A costing method that includes all manufacturing costs—direct materials, direct labour, and both variable and fixed overhead—as part of the cost of a finished unit of product. This term is synonymous with *full cost*.

Full cost

Same as *absorption costing*.

PROCESS AND JOB-ORDER COSTING

In computing the cost of a product or a service, managers are faced with a difficult problem. Many costs (such as rent) do not change much from month to month, whereas production may change frequently, with production going up in one month and then down in another. In addition to variations in the level of production, several different products or services may be produced in a given period in the same facility. Under these conditions, how is it possible to

accurately determine the cost of a product or service? In practice, assigning costs to products and services involves an averaging of some type across time periods and across products. The way in which this averaging is carried out will depend heavily on the type of production process involved. Two costing systems are commonly used in manufacturing and in many service companies; these two systems are known as *process costing* and *job-order costing*.

Process Costing

A **process costing system** is used in situations where the company produces many units of a single product (such as frozen orange juice concentrate) for long periods at a time. Examples include producing paper at **Bowater**, refining aluminum ingots at **Alcan**, mixing and bottling beverages at **Coca-Cola**, and making wieners at **J.M. Schneider Inc.** All of these industries are characterized by an essentially homogeneous product that flows evenly through the production process on a continuous basis.

The basic approach in process costing is to accumulate costs in a particular operation or department for an entire period (month, quarter, year) and then to divide this total by the number of units produced during the period. The basic formula for process costing is as follows:

$$\text{Unit cost (per litre, kilogram, bottle)} = \frac{\text{Total manufacturing cost}}{\text{Total units produced (litres, kilograms, bottles)}}$$

Since one unit of product (litre, kilogram, bottle) is indistinguishable from any other unit of product, each unit is assigned the same average cost as any other unit produced during the period. This costing technique results in a broad, average unit cost figure that applies to homogeneous units flowing in a continuous stream out of the production process.

Job-Order Costing

A **job-order costing system** is used in situations where many *different* products are produced each period. For example, a **Levi Strauss** clothing factory would typically make many different types of jeans for both men and women during a month. A particular order might consist of 1,000 stonewashed men's blue denim jeans, style number A312, with a 32-inch waist and a 30-inch inseam. This order of 1,000 jeans is called a *batch* or a *job*. In a job-order costing system, costs are traced and allocated to jobs and then the costs of the job are divided by the number of units in the job to arrive at an average cost per unit.

Other examples of situations where job-order costing would be used include large-scale construction projects managed by **Bechtel International**, commercial aircraft produced by **Bombardier**, greeting cards designed and printed at **Hallmark**, and airline meals prepared by **Cara**. All of these examples are characterized by diverse outputs. Each **Bechtel** project is unique and different from every other—the company may be simultaneously constructing a dam in Zaire and a bridge in Indonesia. Likewise, each airline orders a different type of meal from **Cara's** catering service.

Job-order costing is also used extensively in service industries. Hospitals, law firms, movie studios, accounting firms, advertising agencies, and repair shops all use a variation of job-order costing to accumulate costs for accounting and billing purposes. For example, the production of the British Open golf broadcast by **TSN** would be suitable as a job costing project.

Although the detailed example of job-order costing provided in the following section deals with a manufacturing firm, the same basic concepts and procedures are used by many service organizations. The essential difference for service organizations is the lack of raw materials in the cost of their services. For example, a public accounting firm would have cost elements involving direct labour and overhead but not raw materials, because the firm does not make a physical item. However, to avoid duplicating the discussion that follows, the more comprehensive manufacturing environment will be presented, with the service application addressed in exercises and problems.

LEARNING OBJECTIVE 1

Distinguish between process costing and job-order costing and identify companies that would use each costing method.

Process costing system

A costing system used in those manufacturing situations where a single, homogeneous product (such as cement or flour) is produced for long periods of time.

Job-order costing system A costing system used in situations where many different products, jobs, or services are produced each period.



The record-keeping and cost assignment problems are more complex when a company sells many different products and services than when it has only a single product. Since the products are different, the costs are typically different. Consequently, cost records must be maintained for each distinct product or job. For example, an attorney in a large criminal law practice would ordinarily keep separate records of the costs of advising and defending each of her clients. And the **Levi Strauss** factory mentioned earlier would keep separate track of the costs of filling orders for particular styles, sizes, and colours of jeans. Thus, a job-order costing system requires more effort than a process costing system.

In this chapter, we focus on the design of a job-order costing system. In the following chapter, we focus on process costing and also look more closely at the similarities and differences between the two costing methods.

JOB-ORDER COSTING—AN OVERVIEW

LEARNING OBJECTIVE 2

Identify the documents used in a job-order costing system.

To introduce job-order costing, we will follow a specific job as it progresses through the manufacturing process. This job consists of two experimental couplings that Yost Precision Machining has agreed to produce for Loops Unlimited, a manufacturer of roller coasters. The couplings connect the cars on the roller coaster and are a critical component in the performance and safety of the ride. Before we begin our discussion, recall from Chapter 2 that companies generally classify manufacturing costs into three broad categories: (1) direct materials, (2) direct labour, and (3) manufacturing overhead. As we study the operation of a job-order costing system, we will see how each of these three types of costs is recorded and accumulated.

MANAGERIAL ACCOUNTING IN ACTION

The Issue

YOST★
PRECISION MACHINING

Yost Precision Machining is a small company in Nova Scotia that specializes in fabricating precision metal parts that are used in a variety of applications, ranging from deep-sea exploration vehicles to the inertial triggers in automobile air bags. The company's top managers gather every day at 8:00 A.M. in the company's conference room for the daily planning meeting. Attending the meeting this morning are Jean Yost, the company's president; David Cheung, the marketing manager; Debbie Turner, the production manager; and Marcus White, the company controller. The president opened the meeting:

- Jean:** The production schedule indicates we'll be starting job 2B47 today. Isn't that the special order for experimental couplings, David?
- David:** That's right, Jean. That's the order from Loops Unlimited for two couplings for their new roller coaster ride for Magic Mountain.
- Debbie:** Why only two couplings? Don't they need a coupling for every car?
- David:** That's right. But this is a completely new roller coaster. The cars will go faster and will be subjected to more twists, turns, drops, and loops than on any other existing roller coaster. To hold up under these stresses, Loops Unlimited's engineers had to completely redesign the cars and couplings. They want to thoroughly test the design before proceeding to large-scale production. So they want us to make just two of these new couplings for testing purposes. If the design works, then we'll have the inside track on the order to supply couplings for the whole ride.
- Jean:** We agreed to take on this initial order at our cost just to get our foot in the door. Marcus, will there be any problem documenting our cost so we can get paid?
- Marcus:** No problem. The contract with Loops stipulates that they will pay us an amount equal to our cost of goods sold. With our job-order costing system, I can tell you that number on the day the job is completed.
- Jean:** Good. Is there anything else we should discuss about this job at this time? No? Well then let's move on to the next item of business.

Measuring Direct Materials Cost

Yost Precision Machining will require four G7 connectors and two M46 housings to make the two experimental couplings for Loops Unlimited. If this was a standard product, there would be a *bill of materials* for the product. A **bill of materials** is a document that lists the type and quantity of each item of the materials needed to complete a unit of product. In this case, there is no established bill of materials, so Yost's production staff determined the materials requirements from the blueprints submitted by the customer. Each coupling requires two connectors and one housing, so to make two couplings, four connectors and two housings are required.

When an agreement has been reached with the customer concerning the quantities, prices, and shipment date for the order, a *production order* is issued. The Production Department then prepares a *materials requisition form* similar to the form in Exhibit 3–1. The **materials requisition form** is a detailed source document that (1) specifies the type and quantity of materials to be drawn from the storeroom, and (2) identifies the job to which the costs of the materials are to be charged. It serves as a means for controlling the flow of materials into production and also for making entries in the accounting records.

The Yost Precision Machining materials requisition form in Exhibit 3–1 shows that the company's Milling Department has requisitioned two M46 housings and four G7 connectors for job 2B47. This completed form is presented to the storeroom clerk who then issues the necessary raw materials. The storeroom clerk is not allowed to release materials without such a form bearing an authorized signature.

The previous paragraphs used the terms *direct materials* and *raw materials*, which should be clarified. Direct materials represent materials that are directly traced to the product or service. Raw materials are ingredients that are converted into a finished product. Semi-finished materials, or supplies for a service job, could be considered direct materials if they were important enough to be directly traced to the job, but they will not be raw materials. In summary, because raw materials can be direct materials but all direct materials do not need to be raw materials, the terms often appear interchangeably in business terminology.

Job Cost Sheet

After being notified that the production order has been issued, the Accounting Department prepares a *job cost sheet* similar to the one presented in Exhibit 3–2. A **job cost sheet** is a form prepared for each separate job that records the materials, labour, and overhead costs charged to the job.

Bill of materials

A document that shows the type and quantity of each major item of the materials required to make a product.

Materials requisition form

A detailed source document that specifies the type and quantity of materials that are to be drawn from the storeroom and identifies the job to which the costs of materials are to be charged.

Job cost sheet

A form prepared for each job that records the materials, labour, and overhead costs charged to the job.


Materials Requisition Number		Date	
14873			
Job Number to Be Charged			
2B47			
Department			
Milling			
Description	Quantity	Unit Cost	Total Cost
M46 Housing	2	\$124	248
G7 Conector	4	103	412
			<u>\$660</u>
 Authorized Signature			

EXHIBIT 3–1 Materials Requisition Form

EXHIBIT 3-2 Job Cost Sheet

JOB COST SHEET							
Job Number				Date Initiated			
2B47				March 2			
Department				Date Completed			
Milling							
Item				Units Completed			
For Stock							
Direct Materials		Direct Labour			Manufacturing Overhead		
Req. No.	Amount	Ticket	Hours	Amount	Hours	Rate	Amount
14873	\$660	843	5	\$45			
Cost Summary				Units Shipped			
Direct Materials		\$		Date	Number	Balance	
Direct Labour		\$					
Manufacturing Overhead		\$					
Total Cost		\$					
Unit Cost		\$					

After direct materials are issued, the Accounting Department records their costs directly on the job cost sheet. Note from Exhibit 3-2, for example, that the \$660 cost for direct materials shown earlier on the materials requisition form has been charged to job 2B47 on its job cost sheet. The requisition number 14873 is also recorded on the job cost sheet to make it easier to identify the source document for the direct materials charge.

In addition to serving as a means for charging costs to jobs, the job cost sheet also serves as a key part of a firm’s accounting records. The job cost sheets form a subsidiary ledger to the Work in Process account. They are detailed records for the jobs in process that add up to the balance in Work in Process.

Measuring Direct Labour Cost

Direct labour cost is handled in much the same way as direct materials cost. Direct labour consists of labour charges that are easily traced to a particular job. Labour charges that cannot be easily traced directly to any job are treated as part of manufacturing overhead. As discussed in Chapter 2, this latter category of labour costs is termed *indirect labour* and includes tasks such as maintenance, supervision, and clean-up.

Workers use *time tickets* to record the time they spend on each job and task. A completed **time ticket** is an hour-by-hour summary of the employee’s activities throughout the day. An example of an employee time ticket is shown in Exhibit 3-3. When working on a specific job, the employee enters the job number on the time ticket and notes the amount of time spent on that job. When not assigned to a particular job, the employee

Time ticket

A detailed source document that is used to record an employee’s hour-by-hour activities during a day.

Time Ticket No.		Date			
843		March 3			
Employee		Station			
Mary Holden		4			
Started	Ended	Time Completed	Rate	Amount	Job Number
7:00	12:00	5.0	\$9	\$45	2B47
12:30	2:30	2.0	9	18	2B50
2:30	3:30	1.0	9	9	Maintenance
Totals		8.0		\$72	

R.W. Pace

Supervisor

EXHIBIT 3-3 Employee Time Ticket

records the nature of the indirect labour task (such as clean-up and maintenance) and the amount of time spent on the task.

At the end of the day, the time tickets are gathered and the Accounting Department enters the direct labour-hours and costs on individual job cost sheets. (See Exhibit 3-2 for an example of how direct labour costs are entered on the job cost sheet.) The daily time tickets are source documents that are used as the basis for labour cost entries into the accounting records.

The system we have just described is a manual method for recording and posting labour costs. Many companies now rely on computerized systems and no longer record labour time by hand on sheets of paper. One computerized approach uses bar codes to enter the basic data into the computer. Each employee and each job has a unique bar code. When an employee begins work on a job, he or she scans three bar codes, using a hand-held device much like the bar code readers at grocery store checkout stands. The first bar code indicates that a job is being started; the second is the unique bar code on the employee's identity badge; and the third is the unique bar code of the job itself. This information is fed automatically via an electronic network to a computer that notes the time and then records all of the data. When the employee completes the task, he or she scans a bar code indicating the task is complete, the bar code on the employee's identity badge, and the bar code attached to the job. This information is relayed to the computer that again

FOCUS on Current Practice

Canada's health care system gives Canadian business a striking competitive advantage with respect to labour costs. As Kirstin Downey writes:

Employers in Canada pay only about \$50 a month, or \$600 a year, mostly for optional items such as eyeglasses and orthopedic shoes, said Elaine Bernard, executive director of the labour and worklife program at Harvard Law School. "Health care is significantly cheaper for corporations in Canada," she said. U.S. employers pay more than 10 times as much—an average \$552 a month per employee for health insurance, according to the Kaiser Family Foundation.

Source: Kirstin Downey, "A Heftier Dose to Swallow Rising Cost of Health Care in U.S. Gives Other Developed Countries an Edge in Keeping Jobs," *Washington Post*, March 6, 2004, pp. E01.

notes the time, and a time ticket is automatically prepared. Since all of the source data is already in computer files, the labour costs can automatically be posted to job cost sheets (or their electronic equivalents). Computers, coupled with technology such as bar codes, can eliminate much of the drudgery involved in routine bookkeeping activities while at the same time increasing timeliness and accuracy.

Application of Manufacturing Overhead

Manufacturing overhead must be included with direct materials and direct labour on the job cost sheet since manufacturing overhead is also a product cost. However, assigning manufacturing overhead to units of product can be a difficult task. There are three reasons for this.

1. Manufacturing overhead is an *indirect cost*. This means that it is either impossible or difficult to trace these costs to a particular product or job.
2. Manufacturing overhead consists of many different items, ranging from the grease used in machines to the annual salary of the production manager.
3. Even though output may fluctuate due to seasonal or other factors, manufacturing overhead costs tend to remain relatively constant due to the presence of fixed costs.

Given these problems, about the only way to assign overhead costs to products is to use an allocation process. This allocation of overhead costs is accomplished by selecting an *allocation base* that is common to all of the company's products and services. An **allocation base** is a measure such as direct labour-hours (DLH) or machine-hours (MH) that is used to assign overhead costs to products and services.

The most widely used allocation bases are direct labour-hours and direct labour cost, with machine-hours and even units of product (where a company has only a single product) also used to some extent.

The allocation base is used to compute the **predetermined overhead rate** in the following formula:

$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total units in the allocation base}}$$

Note that the predetermined overhead rate is based on *estimated* rather than actual figures. This is because the *predetermined* overhead rate is computed *before* the period begins and is used to *apply* overhead cost to jobs throughout the period. The process of assigning overhead cost to jobs is called **overhead application**. The formula for determining the amount of overhead cost to apply to a particular job is:

$$\text{Overhead applied to a particular job} = \text{Predetermined overhead rate} \times \text{Amount of the allocation base incurred by the job}$$

For example, if the predetermined overhead rate is \$8 per direct labour-hour, then \$8 of overhead is *applied* to a job for each direct labour-hour incurred by the job. When the allocation base is direct labour-hours, the formula becomes:

$$\text{Overhead applied to a particular job} = \text{Predetermined overhead rate} \times \text{Actual direct labour-hours charged to the job}$$

Using the Predetermined Overhead Rate To illustrate the steps involved in computing and using a predetermined overhead rate, let's return to Yost Precision Machining. The company has estimated its total manufacturing overhead costs to be \$320,000 for the year and its total direct labour-hours to be 40,000. Its predetermined overhead rate for the year would be \$8 per direct labour-hour, as shown as follows:

LEARNING OBJECTIVE 3

Compute predetermined overhead rates and explain why estimated overhead costs (rather than actual overhead costs) are used in the costing process.

Allocation base

A measure of activity such as direct labour-hours or machine-hours that is used to assign costs to cost objects.

Predetermined overhead rate

A rate used to charge overhead cost to jobs in production; the rate is established in advance for each period by use of estimates of total manufacturing overhead cost and of the total allocation base for the period.

Overhead application

The process of charging manufacturing overhead cost to job cost sheets and to the Work in Process account.

$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total units in the allocation base}}$$

$$\frac{\$320,000}{40,000 \text{ direct labour-hours}} = \$8 \text{ per direct labour-hour}$$

The job cost sheet in Exhibit 3–4 indicates that 27 direct labour-hours were charged to job 2B47. Therefore, a total of \$216 of overhead cost would be applied to the job:

$$\begin{array}{l} \text{Overhead applied to} \\ \text{job 2B47} \end{array} = \begin{array}{l} \text{Predetermined} \\ \text{overhead rate} \end{array} \times \begin{array}{l} \text{Actual direct labour-hours} \\ \text{charged to job 2B47} \end{array}$$

$$\$8/\text{DLH} \times 27 \text{ direct labour-hours} = \$216 \text{ of overhead applied to job 2B47}$$

This amount of overhead has been entered on the job cost sheet in Exhibit 3–4. Note that this is *not* the actual amount of overhead caused by the job. There is no attempt to trace actual overhead costs to jobs—if that could be done, the costs would be direct costs, not overhead. The overhead assigned to the job is simply a share of the total overhead that was estimated at the beginning of the year. When a company applies overhead cost to jobs

EXHIBIT 3–4 A Completed Job Cost Sheet

JOB COST SHEET							
Job Number				Date Initiated			
2B47				March 2			
Department				Date Completed			
Milling				March 8			
Item				Units Completed			
Special order coupling				2			
For Stock							
Direct Materials		Direct Labour			Manufacturing Overhead		
Req. No.	Amount	Ticket	Hours	Amount	Hours	Rate	Amount
14873	\$ 660	843	5	\$ 45	27	\$8/DLH	<u>\$216</u>
14875	506	846	8	60			
14912	238	850	4	21			
	<u>\$1,404</u>	851	10	54			
			<u>27</u>	<u>\$180</u>			
Cost Summary				Units Shipped			
Direct Materials		\$1,404		Date	Number	Balance	
Direct Labour		\$ 180		March 8		2	
Manufacturing Overhead		\$ 216					
Total Cost		\$1,800					
Unit Cost		\$ 900*					

Normal cost system

A costing system in which overhead costs are applied to jobs by multiplying a predetermined overhead rate by the actual amount of the allocation base incurred by the job.

as we have done—that is, by multiplying actual activity times the predetermined overhead rate—it is called a **normal cost system**.

The overhead may be applied as direct labour-hours are charged to jobs, or all of the overhead can be applied at once when the job is completed. The choice is up to the company. If a job is not completed at year-end, however, overhead should be applied to value the work in process inventory.

The Need For a Predetermined Rate Instead of using a predetermined rate, a company could wait until the end of the accounting period to compute an actual overhead rate based on the *actual* total manufacturing costs and the *actual* total units in the allocation base for the period. However, managers cite several reasons for using predetermined overhead rates instead of actual overhead rates:

1. Managers would like to know the accounting system's valuation of completed jobs before the end of the accounting period. Suppose, for example, that Yost Precision Machining waits until the end of the year to compute its overhead rate. Then there would be no way for managers to know the cost of goods sold for job 2B47 until the close of the year, even though the job was completed and shipped to the customer in March. The seriousness of this problem can be reduced to some extent by computing the actual overhead more frequently, but that immediately leads to another problem, as discussed below.
2. If actual overhead rates are computed frequently, seasonal factors in overhead costs or in the allocation base can produce fluctuations in the overhead rates. For example, the costs of heating and cooling a production facility in Halifax will be highest in the winter and summer months and lowest in the spring and fall. If an overhead rate were computed each month or each quarter, the predetermined overhead rate would go up in the winter and summer and down in the spring and fall. Two identical jobs, one completed in the winter and one completed in the spring, would be assigned different costs if the overhead rate were computed on a monthly or quarterly basis. Managers generally feel that such fluctuations in overhead rates and costs serve no useful purpose and are misleading.
3. The use of a predetermined overhead rate simplifies record-keeping. To determine the overhead cost to apply to a job, the accounting staff at Yost Precision Machining simply multiplies the direct labour-hours recorded for the job by the predetermined overhead rate of \$8 per direct labour-hour.

For these reasons, most companies use predetermined overhead rates rather than actual overhead rates in their cost accounting systems.

Choice of an Allocation Base for Overhead Cost

Ideally, an allocation base should be used that is a *cost driver* of overhead cost. A **cost driver** is a factor, such as machine-hours, beds occupied, computer time, or flight-hours, that causes overhead costs. If a base is used to compute overhead rates that does not “drive” overhead costs, then the result will be inaccurate overhead rates and distorted product costs. For example, if direct labour-hours is used to allocate overhead, but in reality overhead has little to do with direct labour-hours, then products with high direct labour-hour requirements will shoulder an unrealistic burden of overhead and will be overcosted.

Most companies use direct labour-hours or direct labour cost as the allocation base for manufacturing overhead. However, as discussed in earlier chapters, major shifts are taking place in the structure of costs in many industries. In the past, direct labour accounted for up to 60% of the cost of many products, with overhead cost making up only a portion of the remainder. This situation has been changing—for two reasons. First, sophisticated automated equipment has taken over functions that used to be performed by direct labour workers. Since the costs of acquiring and maintaining such equipment are

Cost driver

A factor, such as machine-hours, beds occupied, computer time, or flight-hours, that causes overhead costs.

classified as overhead, this increases overhead while decreasing direct labour. Second, products are themselves becoming more sophisticated and complex and change more frequently. This increases the need for highly skilled indirect workers such as engineers. As a result of these two trends, direct labour is becoming less of a factor and overhead is becoming more of a factor in the cost of products in many industries.

In companies where direct labour and overhead costs have been moving in opposite directions, it would be difficult to argue that direct labour “drives” overhead costs. Accordingly, in recent years, managers in some companies have used *activity-based costing* principles to redesign their cost accounting systems. Activity-based costing is a costing technique that is designed to more accurately reflect the demands that products, customers, and other cost objects make on overhead resources. The activity-based approach is discussed in more detail in Chapter 8.

We hasten to add that although direct labour may not be an appropriate allocation basis in some industries, in others it continues to be a significant driver of manufacturing overhead. Indeed, most manufacturing companies in North America continue to use direct labour as the primary or secondary allocation base for manufacturing overhead. The key point is that the allocation base used by the company should really drive, or cause, overhead costs, and direct labour is not always an appropriate allocation base.

FOCUS on Current Practice

CPI Plastics Group Ltd. of Mississauga, Ontario, has three major operating segments—outdoor living products, film products, and custom products. The company was able to reduce manufacturing labour costs during the first quarter of 2002 by employing a strategy that included increasing consumer products sales while also making improving plant efficiencies. Manufacturing overhead costs, however, rose during the same period due to increased plant electricity costs resulting from deregulation in the electricity market in the Province of Ontario.

Source: CPI Plastics Group Ltd., *First Quarter Report*, ended March 31, 2003.

Computation of Unit Costs

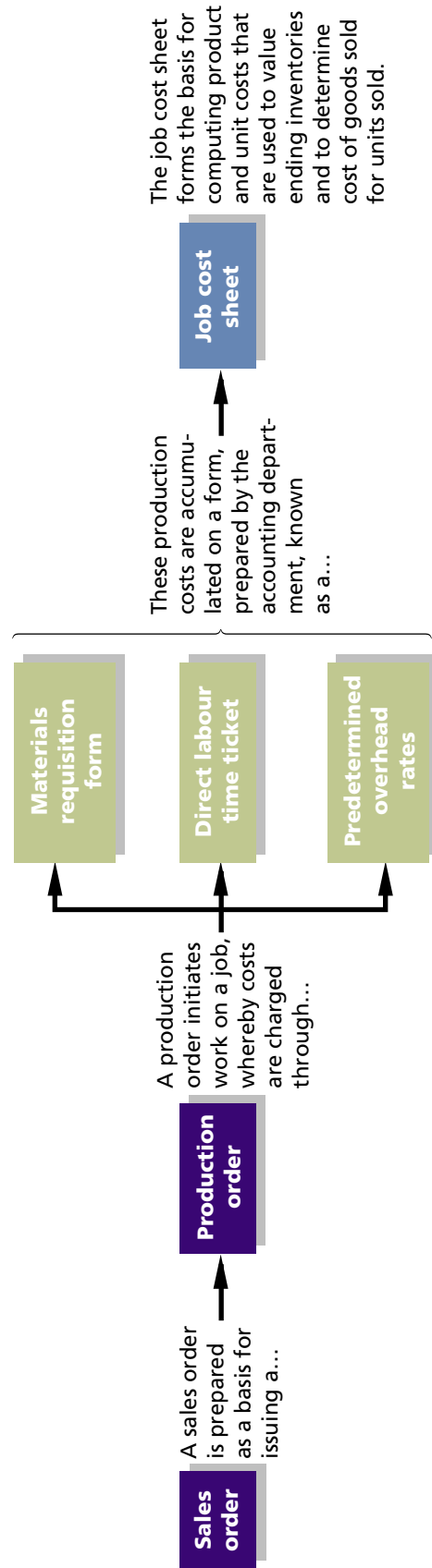
With the application of Yost Precision Machining’s \$216 manufacturing overhead to the job cost sheet in Exhibit 3–4, the job cost sheet is almost complete. There are two final steps. First, the totals for direct materials, direct labour, and manufacturing overhead are transferred to the Cost Summary section of the job cost sheet and added together to obtain the total cost for the job. Then the total cost (\$1,800) is divided by the number of units (2) to obtain the unit cost (\$900). As indicated earlier, *this unit cost is an average cost and should not be interpreted as the cost that would actually be incurred if another unit was produced*. Much of the actual overhead would not change at all if another unit was produced, so the incremental cost of an additional unit is something less than the average unit cost of \$900.

The completed job cost sheet is now ready to be transferred to the Finished Goods inventory account, where it will serve as the basis for valuing unsold units in ending inventory and determining cost of goods sold.

Summary of Document Flows

The sequence of events discussed above is summarized in Exhibit 3–5. A careful study of the flow of documents in this exhibit will provide a good overview of the overall operation of a job-order costing system.

EXHIBIT 3-5 The Flow of Documents in a Job-Order Costing System



In the 8:00 A.M. daily planning meeting on March 9, Jean Yost, the president of Yost Precision Machining, once again drew attention to job 2B47, the experimental couplings:

Jean: I see job 2B47 is completed. Let's get those couplings shipped immediately to Loops Unlimited so they can get their testing program under way. Marcus, how much are we going to bill Loops for those two units?

Marcus: Just a second, let me check the job cost sheet for that job. Here it is. We agreed to sell the experimental units at cost, so we will be charging Loops Unlimited just \$900 a unit.

Jean: Fine. Let's hope the couplings work out and we make some money on the big order later.



MANAGERIAL ACCOUNTING IN ACTION

The Wrap-Up

YOST ★
PRECISION MACHINING

JOB-ORDER COSTING—THE FLOW OF COSTS

We are now ready to take a more detailed look at the flow of costs through the company's formal accounting system. To illustrate, we shall consider a single month's activity for Rand Company, a producer of gold and silver commemorative medallions. Rand Company has two jobs in process during April, the first month of its fiscal year. Job A, a special minting of 1,000 gold medallions commemorating the world junior hockey championships held in Halifax, was started during March and had \$30,000 in manufacturing costs already accumulated on April 1. Job B, an order for 10,000 silver medallions commemorating the same event, was started in April.

LEARNING OBJECTIVE 4

Record the journal entries that reflect the flow of costs in a job-order costing system.

The Purchase and Issue of Materials

On April 1, Rand Company had \$7,000 in raw materials on hand. During the month, the company purchased an additional \$60,000 in raw materials. The purchase is recorded in journal entry (1) below:

(1)		
Raw Materials	60,000	
Accounts Payable		60,000

As explained in Chapter 2, Raw Materials is an asset account. Thus, when raw materials are purchased, they are initially recorded as an asset—not as an expense.

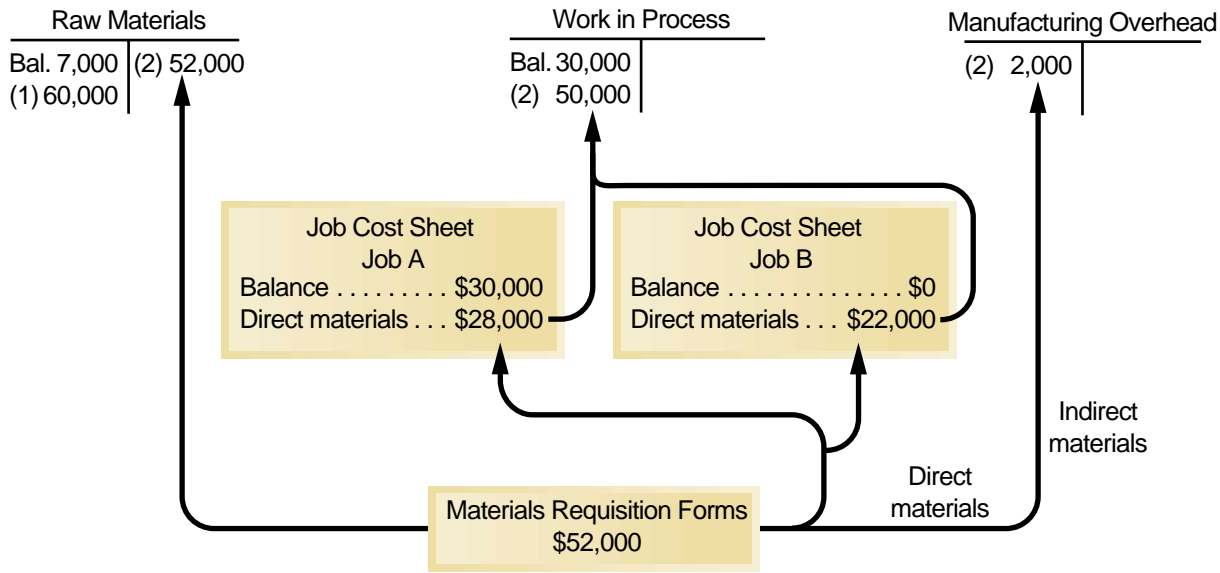
Issue of Direct and Indirect Materials During April, \$52,000 in raw materials were requisitioned from the storeroom for use in production. These raw materials include \$50,000 of direct materials and \$2,000 of indirect materials. Entry (2) records the issue of the materials to the production departments:

(2)		
Work in Process	50,000	
Manufacturing Overhead	2,000	
Raw Materials		52,000

The materials charged to Work in Process represent direct materials for specific jobs. As these materials are entered into the Work in Process account, they are also recorded on the appropriate job cost sheets. This point is illustrated in Exhibit 3–6, where \$28,000 of the \$50,000 in direct materials is charged to job A's cost sheet and the remaining \$22,000 is charged to job B's cost sheet. (In this example, all data are presented in summary form and the job cost sheet is abbreviated.)

The \$2,000 charged to Manufacturing Overhead in entry (2) represents indirect materials used in production during April. Observe that the Manufacturing Overhead account is separate from the Work in Process account. The purpose of the Manufacturing Overhead account is to accumulate all manufacturing overhead costs as they are incurred during a period.

EXHIBIT 3-6 Raw Materials Cost Flows



Before leaving Exhibit 3-6, note that the job cost sheet for job A contains a beginning balance of \$30,000. We stated earlier that this balance represents the cost of work done during March that has been carried forward to April. Also note that the Work in Process account contains the same \$30,000 balance. *The reason the \$30,000 appears in both places is that the Work in Process account is a control account and the job cost sheets form a subsidiary ledger. Thus, the Work in Process account contains a summarized total of all costs appearing on the individual job cost sheets for all jobs in process at any given point in time.* (Since Rand Company had only job A in process at the beginning of April, job A's \$30,000 balance on that date is equal to the balance in the Work in Process account.)

Issue of Direct Materials Only Sometimes the materials drawn from the Raw Materials inventory account are all direct materials. In this case, the entry to record the issue of the materials into production would be as follows:

Work in Process	XXX	
Raw Materials		XXX

Labour Cost

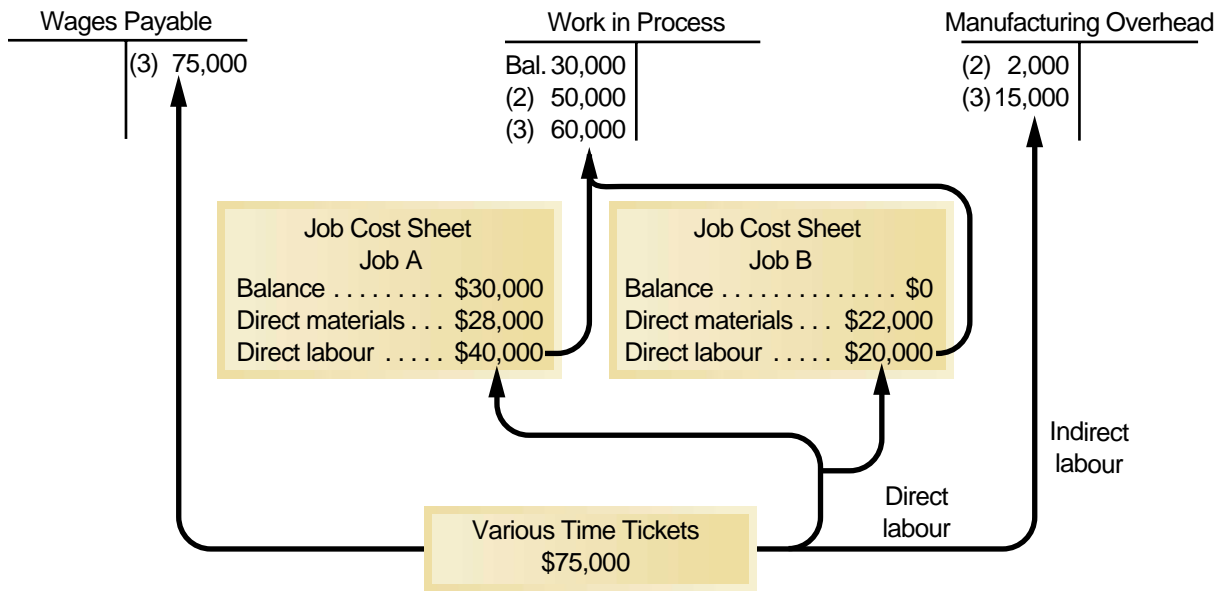
As work is performed in various departments of Rand Company from day to day, employee time tickets are filled out by workers, collected, and forwarded to the Accounting Department. In the Accounting Department, the tickets are costed according to the various employee wage rates, and the resulting costs are classified as either direct or indirect labour. In April, \$60,000 was recorded for direct labour and \$15,000 for indirect labour resulting in the following summary entry:

(3)		
Work in Process	60,000	
Manufacturing Overhead	15,000	
Salaries and Wages Payable		75,000

Only direct labour is added to the Work in Process account. For Rand Company, this amounted to \$60,000 for April.

At the same time that direct labour costs are added to Work in Process, they are also added to the individual job cost sheets, as shown in Exhibit 3-7. During April, \$40,000 of direct labour cost was charged to job A and the remaining \$20,000 was charged to job B.

EXHIBIT 3-7 Labour Cost Flows



The labour costs charged to Manufacturing Overhead represent the indirect labour costs of the period, such as supervision, janitorial work, and maintenance.

Manufacturing Overhead Costs

Recall that all costs of operating the factory other than direct materials and direct labour are classified as manufacturing overhead costs. These costs are entered directly into the Manufacturing Overhead account as they are incurred. To illustrate, assume that Rand Company incurred the following general factory costs during April:

Utilities (heat, water, and power)	\$21,000
Rent on factory equipment	16,000
Miscellaneous factory costs	<u>3,000</u>
Total	<u>\$40,000</u>

The following entry records the incurrence of these costs:

(4)	
Manufacturing Overhead	40,000
Accounts Payable	40,000

In addition, let us assume that during April, Rand Company recognized \$13,000 in accrued property taxes and that \$7,000 in prepaid insurance expired on factory buildings and equipment. The following entry records these items:

(5)	
Manufacturing Overhead	20,000
Property Taxes Payable	13,000
Prepaid Insurance	7,000

Finally, let us assume that the company recognized \$18,000 in depreciation on factory equipment during April. The following entry records the accrual of this depreciation:

(6)	
Manufacturing Overhead	18,000
Accumulated Depreciation	18,000

In short, *all* manufacturing overhead costs are recorded directly into the Manufacturing Overhead account as they are incurred day by day throughout a period. It is important to understand that Manufacturing Overhead is a control account for many—perhaps thousands—of subsidiary accounts such as Indirect Materials, Indirect Labour, Factory Utilities, and so forth. As the Manufacturing Overhead account is debited for costs during a period, the various subsidiary accounts are also debited. In the example above and also in the assignment material for this chapter, we omit the entries to the subsidiary accounts for the sake of brevity.

LEARNING OBJECTIVE 5
Apply overhead cost to Work in Process using a predetermined overhead rate.

The Application of Manufacturing Overhead

Since actual manufacturing costs are charged to the Manufacturing Overhead control account rather than to Work in Process, how are manufacturing overhead costs assigned to Work in Process? The answer is, by means of the predetermined overhead rate. Recall from our discussion earlier in the chapter that a predetermined overhead rate is established at the beginning of each year. The rate is calculated by dividing the estimated total manufacturing overhead cost for the year by the estimated total units in the allocation base (measured in machine-hours, direct labour-hours, or some other base). The predetermined overhead rate is then used to apply overhead costs to jobs. For example, if direct labour-hours is the allocation base, overhead cost is applied to each job by multiplying the number of direct labour-hours charged to the job by the predetermined overhead rate.

To illustrate, assume that Rand Company has used machine-hours in computing its predetermined overhead rate and that this rate is \$6 per machine-hour. Also assume that during April, 10,000 machine-hours were worked on job A and 5,000 machine-hours were worked on job B (a total of 15,000 machine-hours). Thus, \$90,000 in overhead cost (15,000 machine-hours × \$6 = \$90,000) would be applied to Work in Process. The following entry records the application of Manufacturing Overhead to Work in Process:

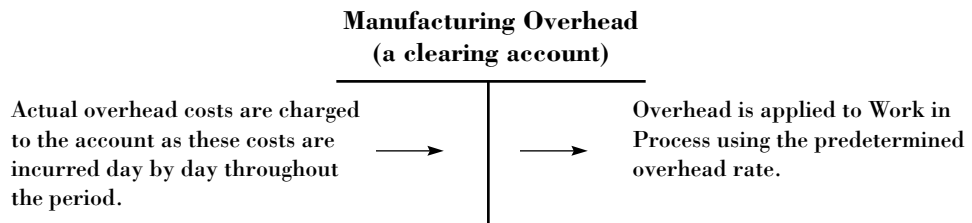
(7)

Work in Process	90,000	
Manufacturing Overhead		90,000

The flow of costs through the Manufacturing Overhead account is detailed in Exhibit 3–8.

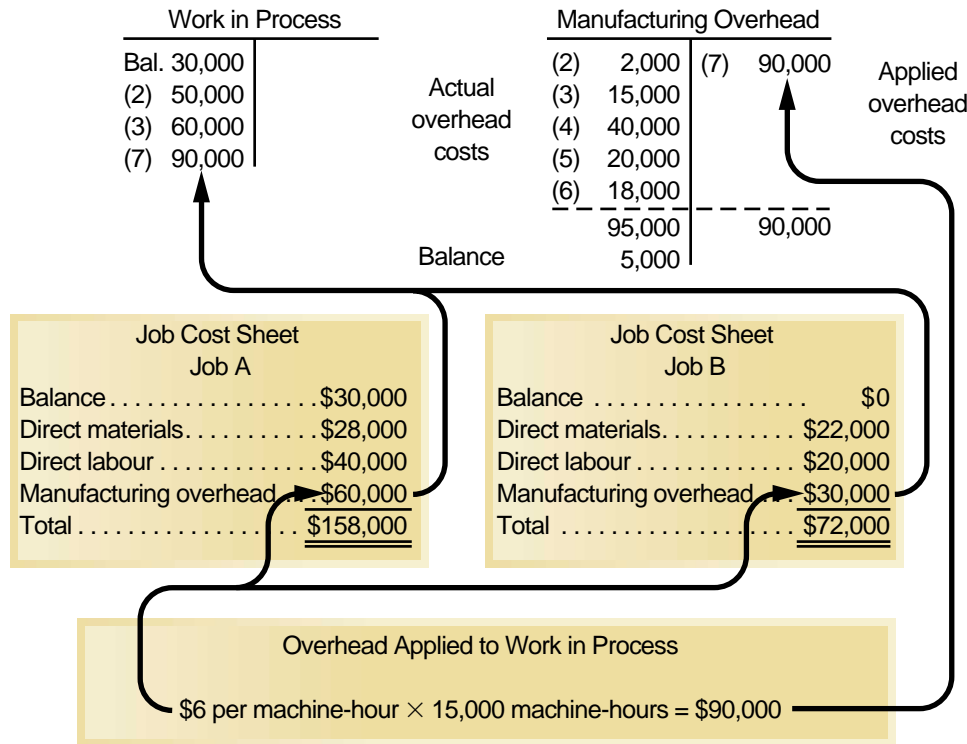
The “actual overhead costs” in the Manufacturing Overhead account shown in Exhibit 3–8 are the costs that were added to the account in entries (2)–(6). Observe that the incurrence of these actual overhead costs [entries (2)–(6)] and the application of overhead to Work in Process [entry (7)] represent two separate and entirely distinct processes.

The Concept of a Clearing Account The Manufacturing Overhead account operates as a clearing account. As we have noted, actual factory overhead costs are debited to the accounts as they are incurred day by day throughout the year. At certain intervals during the year, usually when a job is completed, overhead cost is released from the Manufacturing Overhead account and is applied to the Work in Process account by means of the predetermined overhead rate. This sequence of events is illustrated as follows:



The actual overhead costs incurred and shown as debits in the manufacturing account are a result of many different types of overhead costs. A brief list of some of the different types is presented in the journal entries, numbers 4, 5 and 6, or in the schedule of cost of

EXHIBIT 3-8 The Flow of Costs in Overhead Application



goods manufactured, shown in Exhibit 3-11 on page 96 or previously in Exhibit 2-4 on page 36. The clearing account concept actually represents a general ledger control account for a subsidiary ledger that contains the detailed information on each type of overhead cost.

As we emphasized earlier, the predetermined overhead rate is based entirely on estimates of what overhead costs are *expected* to be, and it is established before the year begins. As a result, the overhead cost applied during a year will almost certainly turn out to be more or less than the overhead cost that is actually incurred. For example, notice from Exhibit 3-8 that Rand Company’s actual overhead costs for the period are \$5,000 greater than the overhead cost that has been applied to Work in Process, resulting in a \$5,000 debit balance in the Manufacturing Overhead account. We will reserve discussion of what to do with this \$5,000 balance until a later section in this chapter, *Complications of Overhead Application*.

For the moment, we can conclude by noting from Exhibit 3-8 that the cost of a completed job consists of the actual materials cost of the job, the actual labour cost of the job, and the overhead cost *applied* to the job. Pay particular attention to the following subtle but important point: *Actual overhead costs are not charged to jobs; actual overhead costs do not appear on the job cost sheet nor do they appear in the Work in Process account. Only the applied overhead cost, based on the predetermined overhead rate, appears on the job cost sheet and in the Work in Process account.* Study this point carefully.

Non-Manufacturing Costs

In addition to manufacturing costs, companies also incur marketing and selling costs. As explained in Chapter 2, these costs should be treated as period expenses and charged directly to the income statement. *Non-manufacturing costs should not go into the Manufacturing Overhead account.* To illustrate the correct treatment of non-manufacturing costs, assume that Rand Company incurred \$30,000 of selling and administrative costs during April. The following entry records these salaries:

	(8)	
Salaries Expense	30,000	
Salaries and Wages Payable		30,000

Assume that depreciation on office equipment during April was \$7,000. The entry is as follows:

	(9)	
Depreciation Expense	7,000	
Accumulated Depreciation		7,000

Pay particular attention to the difference between this entry and entry (6) where we recorded depreciation on factory equipment. In journal entry (6), depreciation on factory equipment was debited to Manufacturing Overhead and is therefore a product cost. In journal entry (9) above, depreciation on office equipment was debited to Depreciation Expense. Depreciation on office equipment is considered to be a period expense rather than a product cost.

Finally, assume that advertising was \$42,000 and that other selling and administrative expenses in April totalled \$8,000. The following entry records these items:

	(10)	
Advertising Expense	42,000	
Other Selling and Administrative Expense	8,000	
Accounts Payable		50,000

Because the amounts in entries (8) through (10) all go directly into expense accounts, they will have no effect on product costs. The same will be true of any other selling and administrative expenses incurred during April, including sales commissions, depreciation on sales equipment, rent on office facilities, insurance on office facilities, and related costs.

The distinction between manufacturing overhead costs and non-manufacturing costs such as selling and administrative expenses is sometimes difficult because of the type of cost. For example, depreciation or salaries should be classified as product costs if related to manufacturing but are classified as period costs and expensed if related to non-manufacturing activities. In practice, the classification has to be based on what the firm does to incur the costs. If it sells or markets, then this is not production and the distinction is clear. If, however, it administers, then the distinction depends on what is administered and how important it is to separate production administration from overall administration. For example, if all the company does is produce the Hibernia oil platform, then administration is production (manufacturing) overhead. However, if the company is administering many jobs and marketing new jobs at the same time, it may not be able to distinguish overhead from administrative time on the part of the senior management. Thus, unless costs are needed for a cost-recovery billing, administration salaries expense may be the expeditious way to treat the salaries.

Cost of Goods Manufactured

LEARNING OBJECTIVE 6
Prepare schedules of cost of goods manufactured and cost of goods sold.

When a job has been completed, the finished output is transferred from the production departments to the finished goods warehouse. By this time, the Accounting Department will have charged the job with direct materials and direct labour cost, and manufacturing overhead will have been applied using the predetermined rate. A transfer of these costs must be made within the costing system that *parallels* the physical transfer of the goods to the finished goods warehouse. The costs of the completed job are transferred out of the Work in Process account and into the Finished Goods account. The sum of all amounts transferred between these two accounts represents the cost of goods manufactured for the period. (This point was illustrated earlier in Exhibit 2–4 in Chapter 2.)

In the case of Rand Company, let us assume that job A was completed during April. The following entry transfers the cost of job A from Work in Process to Finished Goods:

(11)		
Finished Goods	158,000	
Work in Process		158,000

The \$158,000 represents the completed cost of job A, as shown on the job cost sheet in Exhibit 3–8. Since job A was the only job completed during April, the \$158,000 also represents the cost of goods manufactured for the month.

Job B was not completed by month-end, so its cost will remain in the Work in Process account and carry over to the next month. If a balance sheet is prepared at the end of April, the cost accumulated thus far on job B will appear as “Work in process inventory” in the assets section.

Cost of Goods Sold

As units in finished goods are shipped to customers their accumulated cost are transferred from the Finished Goods account into the Cost of Goods Sold account. If a complete job is shipped, as in the case where a job has been done to a customer’s specifications, then it is a simple matter to transfer the entire cost appearing on the job cost sheet into the Cost of Goods Sold account. In most cases, however, only a portion of the units involved in a particular job will be immediately sold. In these situations, the unit cost must be used to determine how much product cost should be removed from Finished Goods and charged to Cost of Goods Sold.

For Rand Company, we will assume that 750 of the 1,000 gold medallions in job A were shipped to customers by the end of the month for total sales revenue of \$225,000. Since 1,000 units were produced and the total cost of the job from the job cost sheet was \$158,000, the unit product cost was \$158. The following journal entries would record the sale (all sales are on account):

(12)		
Accounts Receivable	225,000	
Sales		225,000

(13)		
Cost of Goods Sold	118,500	
Finished Goods		118,500
(\$158 per unit × 750 units = \$118,500)		

With entry (13), the flow of costs through our job-order costing system is completed.

Summary of Cost Flows

To pull the entire Rand Company example together, journal entries (1) through (13) are summarized in Exhibit 3–9. The flow of costs through the accounts is presented in T-account form in Exhibit 3–10.

Exhibit 3–11 presents a schedule of cost of goods manufactured and a schedule of cost of goods sold for Rand Company. Note particularly from Exhibit 3–11 that the manufacturing overhead cost on the schedule of cost of goods manufactured is the overhead applied to jobs during the month—not the actual manufacturing overhead costs incurred. The reason for this can be traced back to journal entry (7) and the T-account for Work in Process that appears in Exhibit 3–10. Under a normal costing system as illustrated in this chapter, applied—not actual—overhead costs are applied to jobs and thus to Work in Process inventory. Note also that the cost of goods manufactured for the month (\$158,000) agrees with the amount transferred from Work in Process to Finished Goods for the month, as recorded earlier in entry (11). Also note that this \$158,000 figure is used in computing the cost of goods sold for the month.

An income statement for April is presented in Exhibit 3–12. Observe that the cost of goods sold figure on this statement (\$123,500) is carried down from Exhibit 3–11.

EXHIBIT 3-9 Summary of
Rand Company Journal Entries

	(1)		
Raw Materials	60,000		
Accounts Payable			60,000
	(2)		
Work in Process	50,000		
Manufacturing Overhead	2,000		
Raw Materials			52,000
	(3)		
Work in Process	60,000		
Manufacturing Overhead	15,000		
Salaries and Wages Payable			75,000
	(4)		
Manufacturing Overhead	40,000		
Accounts Payable			40,000
	(5)		
Manufacturing Overhead	20,000		
Property Taxes Payable			13,000
Prepaid Insurance			7,000
	(6)		
Manufacturing Overhead	18,000		
Accumulated Depreciation			18,000
	(7)		
Work in Process	90,000		
Manufacturing Overhead			90,000
	(8)		
Salaries Expense	30,000		
Salaries and Wages Payable			30,000
	(9)		
Depreciation Expense	7,000		
Accumulated Depreciation			7,000
	(10)		
Advertising Expense	42,000		
Other Selling and Administrative Expense	8,000		
Accounts Payable			50,000
	(11)		
Finished Goods	158,000		
Work in Process			158,000
	(12)		
Accounts Receivable	225,000		
Sales			225,000
	(13)		
Cost of Goods Sold	118,500		
Finished Goods			118,500

EXHIBIT 3-11 Schedules of Cost of Goods Manufactured and Cost of Goods Sold

Cost of Goods Manufactured		
Direct materials:		
Raw materials inventory, beginning	\$ 7,000	
Add: Purchases of raw materials	60,000	
Total raw materials available	67,000	
Deduct: Raw materials inventory, ending	15,000	
Raw materials used in production	52,000	
Less indirect materials included in manufacturing overhead	2,000	\$ 50,000
Direct labour		60,000
Manufacturing overhead applied to work in process		90,000
Total manufacturing costs		200,000
Add: Beginning work in process inventory		30,000
		230,000
Deduct: Ending work in process inventory		72,000
Cost of goods manufactured		<u>\$158,000</u>
Cost of Goods Sold		
Finished goods inventory, beginning	\$ 10,000	
Add: Cost of goods manufactured	158,000	
Goods available for sale	168,000	
Deduct: Finished goods inventory, ending	49,500	
Unadjusted cost of goods sold	118,500	
Add: Underapplied overhead	5,000	
Adjusted cost of goods sold		<u>\$123,500</u>

*Note that the underapplied overhead is added to cost of goods sold. If overhead was overapplied, it would be deducted from costs of goods sold.

EXHIBIT 3-12 Income Statement

RAND COMPANY	
Income Statement	
For the Month Ending April 30	
Sales	\$225,000
Less cost of goods sold (\$118,500 + \$5,000)	<u>123,500</u>
Gross margin	101,500
Less selling and administrative expenses:	
Salaries expense	\$30,000
Depreciation expense	7,000
Advertising expense	42,000
Other expense	<u>8,000</u>
	<u>87,000</u>
Net income	<u>\$ 14,500</u>

COMPLICATIONS OF OVERHEAD APPLICATION

We need to consider two complications relating to overhead application. These are (1) the computation of underapplied and overapplied overhead and (2) the disposition of any balance remaining in the Manufacturing Overhead account at the end of a period.

Underapplied and Overapplied Overhead

Since the predetermined overhead rate is established before a period begins and is based entirely on estimated data, there generally will be a difference between the amount of overhead cost applied to Work in Process and the amount of overhead cost actually incurred during a period. In the case of Rand Company, for example, the predetermined overhead rate of \$6 per hour resulted in \$90,000 of overhead cost being applied to Work in Process, whereas actual overhead costs for April proved to be \$95,000 (as shown in Exhibit 3–8). The difference between the overhead cost applied to Work in Process and the actual overhead costs of a period is termed either **underapplied** or **overapplied overhead**. For Rand Company, overhead was underapplied because the applied cost (\$90,000) was \$5,000 less than the actual cost (\$95,000). If the tables had been reversed and the company had applied \$95,000 in overhead cost to Work in Process while incurring actual overhead costs of only \$90,000, then the overhead would have been overapplied.

What is the cause of underapplied or overapplied overhead? The causes can be complex, and a full explanation will have to wait for Chapters 10 and 11. Nevertheless, the basic problem is that the method of applying overhead to jobs using a predetermined overhead rate assumes that actual overhead costs will be proportional to the actual amount of the allocation base incurred during the period. If, for example, the predetermined overhead rate is \$6 per machine-hour, then it is assumed that actual overhead costs incurred will be \$6 for every machine-hour that is actually worked. There are at least two reasons why this may not be true. First, much of the overhead often consists of fixed costs. Since these costs are fixed, they do not grow as the number of machine-hours incurred increases. Second, spending on overhead items may or may not be under control. If individuals who are responsible for overhead costs do a good job, those costs should be less than were expected at the beginning of the period. If they do a poor job, those costs will be more than expected. As we indicated above, however, a fuller explanation of the causes of underapplied and overapplied overhead will have to wait for later chapters.

To illustrate what can happen, suppose that two companies—Turbo Crafters and Black & Howell—have prepared the following estimated data for the coming year:

	Company	
	Turbo Crafters	Black & Howell
Predetermined overhead rate based on	Machine-hours	Direct materials cost
Estimated manufacturing overhead	\$300,000 (a)	\$120,000 (a)
Estimated machine-hours	75,000 (b)	—
Estimated direct materials cost	—	\$ 80,000 (b)
Predetermined overhead rate, (a) ÷ (b)	\$4 per machine-	150% of direct
.	hour	materials cost

Note that when the allocation base is dollars—such as direct material cost in the case of Black and Howell—the predetermined overhead rate is a percentage. When dollars are divided by dollars, the result is a percentage.

Now assume that because of unexpected changes in overhead spending and changes in demand for the companies' products, the *actual* overhead cost and the *actual* activity recorded during the year in each company are as follows:

	Company	
	Turbo Crafters	Black & Howell
Actual manufacturing overhead costs	\$290,000	\$130,000
Actual machine-hours	68,000	—
Actual direct material costs	—	\$ 90,000

LEARNING OBJECTIVE 7

Compute under- or overapplied overhead cost and prepare the journal entry to close the balance in Manufacturing Overhead to the appropriate accounts.

Underapplied overhead

A debit balance in the Manufacturing Overhead account that arises when the amount of overhead cost actually incurred is greater than the amount of overhead cost applied to Work in Process during a period.

Overapplied overhead

A credit balance in the Manufacturing Overhead account that arises when the amount of overhead cost applied to Work in Process is greater than the amount of overhead cost actually incurred during a period.

For each company, note that the actual data for both cost and activity differ from the estimates used in computing the predetermined overhead rate. This results in underapplied and overapplied overhead as follows:

	Company	
	Turbo Crafters	Black & Howell
Actual manufacturing overhead costs	\$290,000	\$130,000
Manufacturing overhead cost applied to Work in Process during the year:		
68,000 <i>actual</i> machine-hours × \$4	272,000	
\$90,000 <i>actual</i> direct materials cost × 150%		135,000
Underapplied (overapplied) overhead	<u>\$ 18,000</u>	<u>\$ (5,000)</u>

For Turbo Crafters, notice that the amount of overhead cost that has been applied to Work in Process (\$272,000) is less than the actual overhead cost for the year (\$290,000). Therefore, overhead is underapplied. Also notice that the original estimate of overhead in Turbo Crafters (\$300,000) is not directly involved in this computation. Its impact is felt only through the \$4 predetermined overhead rate that is used.

For Black & Howell, the amount of overhead cost that has been applied to Work in Process (\$135,000) is greater than the actual overhead cost for the year (\$130,000), and so overhead is overapplied.

A summary of the concepts discussed above is presented in Exhibit 3–13.

Disposition of Under- or Overapplied Overhead Balances

What disposition should be made of any under- or overapplied balance remaining in the Manufacturing Overhead account at the end of a period? Generally, any balance in the account is treated in one of three ways:

1. Closed out to Cost of Goods Sold.
2. Allocated between Work in Process, Finished Goods, and Cost of Goods Sold in proportion to the overhead applied during the current period in the ending balances of these accounts.¹

EXHIBIT 3-13 Summary of Overhead Concepts

At the beginning of the period:

$$\text{Estimated total manufacturing overhead cost} \div \text{Estimated total units in the allocation base} = \text{Predetermined overhead rate}$$

During the period:

$$\text{Predetermined overhead rate} \times \text{Actual total units of the allocation base incurred during the period} = \text{Total manufacturing overhead applied}$$

At the end of the period:

$$\text{Actual total manufacturing overhead cost} - \text{Total manufacturing overhead applied} = \text{Underapplied (overapplied) overhead}$$

1. Some firms prefer to make the allocation on the basis of the total cost of direct materials, direct labour, and applied manufacturing overhead in each of the accounts at the end of the period. This method is not as accurate as allocating the balance in the Manufacturing Overhead account on the basis of just the overhead applied in each of the accounts during the current period.

3. Carried forward to the next period.

The second method, which allocates the under- or overapplied overhead among ending inventories and Cost of Goods Sold, is equivalent to using an “actual” overhead rate and is for that reason considered by many to be more accurate than the first method. Consequently, if the amount of underapplied or overapplied overhead is material, many accountants would insist that the second method be used. In problem assignments, we will always indicate which method you are to use for disposing of under- or overapplied overhead.

Close Out to Cost of Goods Sold As mentioned above, closing out the balance in Manufacturing Overhead to Cost of Goods Sold is simpler than the allocation method. Returning to the example of Rand Company, the entry to close the \$5,000 of underapplied overhead to Cost of Goods Sold would be as follows:

(14)		
Cost of Goods Sold	5,000	
Manufacturing Overhead		5,000

Note that since there is a debit balance in the Manufacturing Overhead account, Manufacturing Overhead must be credited to close out the account. This has the effect of increasing Cost of Goods Sold for April to \$123,500:

Unadjusted cost of goods sold [from entry (13)]	\$118,500
Add underapplied overhead [entry (14) above]	<u>5,000</u>
Adjusted cost of goods sold	<u>\$123,500</u>

After this adjustment has been made, Rand Company’s income statement for April will appear as was shown earlier in Exhibit 3–12.

Allocate among Accounts Allocation of under- or overapplied overhead among Work in Process, Finished Goods, and Cost of Goods Sold is more accurate than closing the entire balance into Cost of Goods Sold. The reason is that allocation assigns overhead costs to where they would have gone in the first place had it not been for the errors in the estimates going into the predetermined overhead rate.

Had Rand Company chosen to allocate the underapplied overhead among the inventory accounts and Cost of Goods Sold, it would first be necessary to determine the amount of overhead that had been applied during April in each of the accounts. The computations would have been as follows:

Overhead applied in work in process inventory, April 30	\$30,000	33.33%
Overhead applied in finished goods inventory, April 30		
(\$60,000/1,000 units = \$60 per unit) × 250 units	15,000	16.67%
Overhead applied in cost of goods sold, April		
(\$60,000/1,000 units = \$60 per unit) × 750 units	<u>45,000</u>	<u>50.00%</u>
Total overhead applied	<u>\$90,000</u>	<u>100.00%</u>

Based on the above percentages, the underapplied overhead (i.e., the debit balance in Manufacturing Overhead) would be allocated as in the following journal entry:

Work in Process (33.33% × \$5,000)	1,666.50	
Finished Goods (16.67% × \$5,000)	833.50	
Cost of Goods Sold (50.00% × \$5,000)	2,500.00	
Manufacturing Overhead		5,000.00

Note that the first step in the allocation was to determine the amount of overhead applied in each of the accounts. For Finished Goods, for example, the total amount of overhead applied to job A, \$60,000, was divided by the total number of units in job A, 1,000 units, to arrive at the average overhead applied of \$60 per unit. Since there were still 250 units from job A in ending finished goods inventory, the amount of overhead applied in the Finished Goods Inventory account was \$60 per unit multiplied by 250 units, or \$15,000 in total.

If overhead had been overapplied, the entry above would have been just the reverse, since a credit balance would have existed in the Manufacturing Overhead account.

An alternative but less accurate way to allocate under- or overapplied overhead among Work in Process, Finished Goods, and Cost of Goods Sold is to use the entire cost of manufacturing in each account.

Had we chosen to allocate the underapplied overhead in the Rand Company example, the computations and entry would have been:

Work in process inventory, April 30		\$ 72,000	36.00%
Finished goods inventory, April 30		49,500	24.75
Cost of goods sold	\$118,500		
Less: Work in process inventory, April 1	30,000		
Finished goods inventory, April 1	10,000	<u>78,500</u>	<u>39.25</u>
Total		<u>\$200,000</u>	<u>100.00%</u>
Work in Process (36.0% × \$5,000)	1,800		
Finished Goods (24.75% × \$5,000)	1,237		
Cost of Goods Sold (39.25% × \$5,000)	1,963		
Manufacturing Overhead		5,000	

A comparison of the percentages above with those using only overhead suggests that total manufacturing costs and overhead were not in the same proportions in each account. This difference is the inaccuracy in the problem resulting from using total manufacturing costs.

The rationale for deducting the beginning work in process and finished goods inventories from the cost of goods sold is to permit the allocation to be based on costs from the current period. By doing so, the 39.25% in the Rand Company example reflects only costs from April and thus corresponds to the period in which the underapplied overhead occurred. Without this adjustment, cost of goods sold would be assigned the overhead difference based on costs carried over from March and thus bear a disproportionate amount of the under- or overapplied overhead.

Carry the Balance Forward Recall the section earlier in this chapter entitled Application of Manufacturing Overhead. Notice that some firms have large seasonal variations in output while being faced with relatively constant overhead costs. Predetermined overhead was used to even out fluctuations in the cost of overhead caused by seasonal variations in output and seasonal variations in costs (e.g., heating costs). The predetermined overhead rate is computed using estimated total manufacturing costs for a year divided by estimated total units in the base. The result is an average rate. When the average predetermined rate is applied to actual production for the period, the applied overhead is determined. The under- or overapplied overhead is a result of two factors: an actual base that is different from one-twelfth of the annual estimated base and actual overhead costs that do not equal one-twelfth of the total estimated overhead costs. Therefore, for any given month, an under- or overapplied overhead amount would be expected. In some months, it would be positive; in other months, it would be negative. Over the year, these amounts may largely cancel out. If this is the situation, then significant debits and credits could be carried forward to the year-end so that a final disposition can be made either by adjusting Cost of Goods Sold or allocating (sometimes termed *prorating*) the amount to the inventories and Cost of Goods Sold.

The Rand Company example would be treated as follows:

Underapplied Overhead		
[a deferred debit balance on the balance sheet]	5,000	
Manufacturing Overhead		5,000

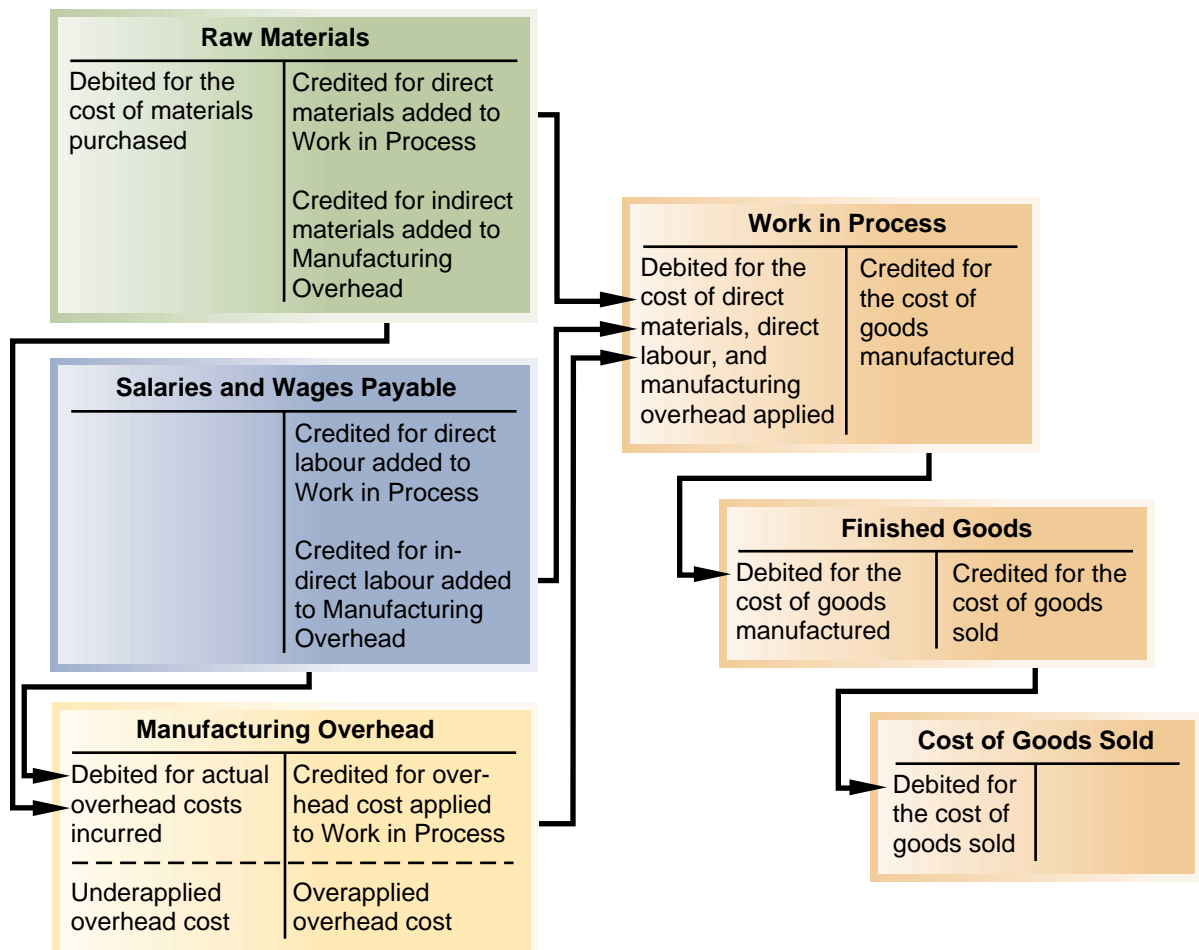
A General Model of Product Cost Flows

The flow of costs in a product costing system is presented in the form of a T-account model in Exhibit 3–14. This model applies as much to a process costing system as it does to a job-order costing system. Examination of this model can be very helpful in gaining a perspective as to how costs enter a system, flow through it, and finally end up as Cost of Goods Sold on the income statement.

Variations from the General Model of Product Cost Flow

Costing systems can vary from what is reflected by the general model. While the general model is the most complete description, circumstances may make such a complete system too costly. For example, a system variation known as *backflush costing* can permit labour charges to be made directly to manufacturing overhead. Then, overhead is applied to the cost of completed jobs along with raw materials, so that the need to keep work in process records can be avoided. Such a minimal treatment of work in process is justified in a mechanized JIT environment. Cost of completed jobs still reflects the material and overhead (including labour), but the record system reflects the simplified needs of the production environment.

EXHIBIT 3–14 A General Model of Cost Flows



Plantwide overhead rate

A single predetermined overhead rate that is used throughout a plant.

Multiple predetermined overhead rates

A costing system in which there are multiple overhead cost pools with a different predetermined rate for each cost pool, rather than a single predetermined overhead rate for the entire company. Frequently, each production department is treated as a separate overhead cost pool.

Multiple Predetermined Overhead Rates

Our discussion of overhead in this chapter has assumed that there is a single predetermined overhead rate for an entire factory called a **plantwide overhead rate**. This is, in fact, a common practice—particularly in smaller companies. But in larger companies, *multiple predetermined overhead rates* are often used. In a **multiple predetermined overhead rate** system there is usually a different overhead rate for each production department. Such a system, while more complex, is considered to be more accurate, because it can reflect differences across departments in how overhead costs are incurred. For example, overhead might be allocated based on direct labour-hours in departments that are relatively labour-intensive and based on machine-hours in departments that are relatively machine-intensive. When multiple predetermined overhead rates are used, overhead is applied in each department according to its own overhead rate as a job proceeds through the department.

To illustrate, refer to the data in the following table where Cook Company has two departments (A and B) and several jobs in process. Data is provided for two of these jobs (X and Y). If the company uses a plantwide overhead rate of \$12 ($\$336,000 \div 28,000 \text{ DLH}$) then the overhead costs applied to Job X and Job Y will be \$8,400 ($\$12 \times 700 \text{ hours} + \12×0) and \$12 ($\$12 \times 0 \text{ hours} + \$12 \times 1 \text{ hour}$) respectively. However, if overhead is applied using department overhead rates then Job X will be assigned \$2,800 ($\$4 \times 700 \text{ direct labour-hours}$) and Job Y will be assigned \$8,400 ($\$12 \times 700 \text{ machine-hours}$).

Cook Company	Department A	Department B	Total
Overhead cost	\$84,000	\$252,000	\$336,000
Direct labour-hours	21,000	7,000	28,000 DLH
Machine-hours	7,000	21,000	28,000 MH
Overhead cost driver	21,000 DLH	21,000 MH	
Overhead rate: Plant wide			\$12 per DLH
By department	\$4/DLH	\$12/MH	
Direct labour-hours— Job X	700	0	
Direct labour-hours— Job Y	0	1	
Machine-hours—Job X	1	0	
Machine-hours—Job Y	0	700	

The decision to use a plantwide rate versus separate rates for each department comes down to cost/benefit. It is cheaper to use a plantwide rate but separate rates are more informative when the activities that drive overhead costs differ among departments. Improved decision making resulting from more accurate overhead data can justify the added costs of gathering separate departmental overhead data.

JOB-ORDER COSTING IN SERVICE COMPANIES

Job-order costing is also used in service organizations such as law firms, movie studios, hospitals, and repair shops, as well as in manufacturing companies. In a law firm, for example, each client represents a “job,” and the costs of that job are accumulated day by day on a job cost sheet as the client’s case is handled by the firm. Legal forms and similar inputs represent the direct materials for the job; the time expended by lawyers represents the direct labour; and the costs of secretaries, clerks, rent, depreciation, and so forth represent the overhead.

In a movie studio, each film produced by the studio is a “job,” and costs for direct materials (costumes, props, film, etc.) and direct labour (actors, directors, and extras) are accounted for and charged to each film’s job cost sheet. A share of the studio’s overhead costs, such as utilities, depreciation of equipment, salaries of maintenance workers, and so forth, is also charged to each film.

In summary, job-order costing is a versatile and widely used costing method, and may be encountered in virtually any organization that provides there are diverse products or services.

USE OF INFORMATION TECHNOLOGY

Earlier in the chapter, we discussed how bar code technology can be used to record labour time—reducing the drudgery in that task and increasing accuracy. Bar codes have many other uses.

In a company with a well-developed bar code system, the manufacturing cycle begins with the receipt of a customer's order in electronic form. Until very recently, the order would have been received via electronic data interchange (EDI), which involves a network of computers linking organizations. An EDI network allows companies to electronically exchange business documents and other information that extend into all areas of business activity from ordering raw materials to shipping completed goods. EDI was developed in the 1980s and requires significant investments in programming and networking hardware. Recently, EDI has been challenged by a far cheaper Internet-based alternative—XML (Extensible Markup Language), an extension of HTML (Hypertext Markup Language). HTML uses codes to tell your Web browser how to display information on your screen, but the computer doesn't know what the information is—it just displays it. XML provides additional tags that identify the kind of information that is being exchanged. For example, price data might be coded as `<price> 14.95 </price>`. When your computer reads this data and sees the tags `<price>` surrounding 14.95, your computer will immediately know that this is a price. XML tags can designate many different kinds of information—customer orders, medical records, bank statements, and so on—and the tags will indicate to your computer how to display, store, and retrieve the information. **Office Depot** was an early adopter of XML, which it is using to facilitate e-commerce with its big customers.



Once an order has been received via EDI or over the Internet in the form of an XML file, the computer draws up a list of required raw materials and sends out electronic purchase orders to suppliers. When materials arrive at the company's plant from the suppliers, bar codes that have been applied by the suppliers are scanned to update inventory records and to trigger payment for the materials. The bar codes are scanned again when the materials are requisitioned for use in production. At that point, the computer credits the Raw Materials inventory account for the amount and type of goods requisitioned and charges the Work in Process inventory account.

A unique bar code is assigned to each job. This bar code is scanned to update Work in Process records for labour and other costs incurred in the manufacturing process. When goods are completed, another scan is performed that transfers both the cost and quantity of goods from the Work in Process inventory account to the Finished Goods inventory account, or charges Cost of Goods Sold for goods ready to be shipped.

Goods ready to be shipped are packed into containers, which are bar-coded with information that includes the customer number, the type and quantity of goods being shipped, and the order number. This bar code is then used for preparing billing information and for tracking the packed goods until placed on a carrier for shipment to the customer. Some customers require that the packed goods be bar-coded with point-of-sale labels that can be scanned at retail checkout counters. These scans allow the retailer to update inventory records, verify price, and generate a customer receipt.

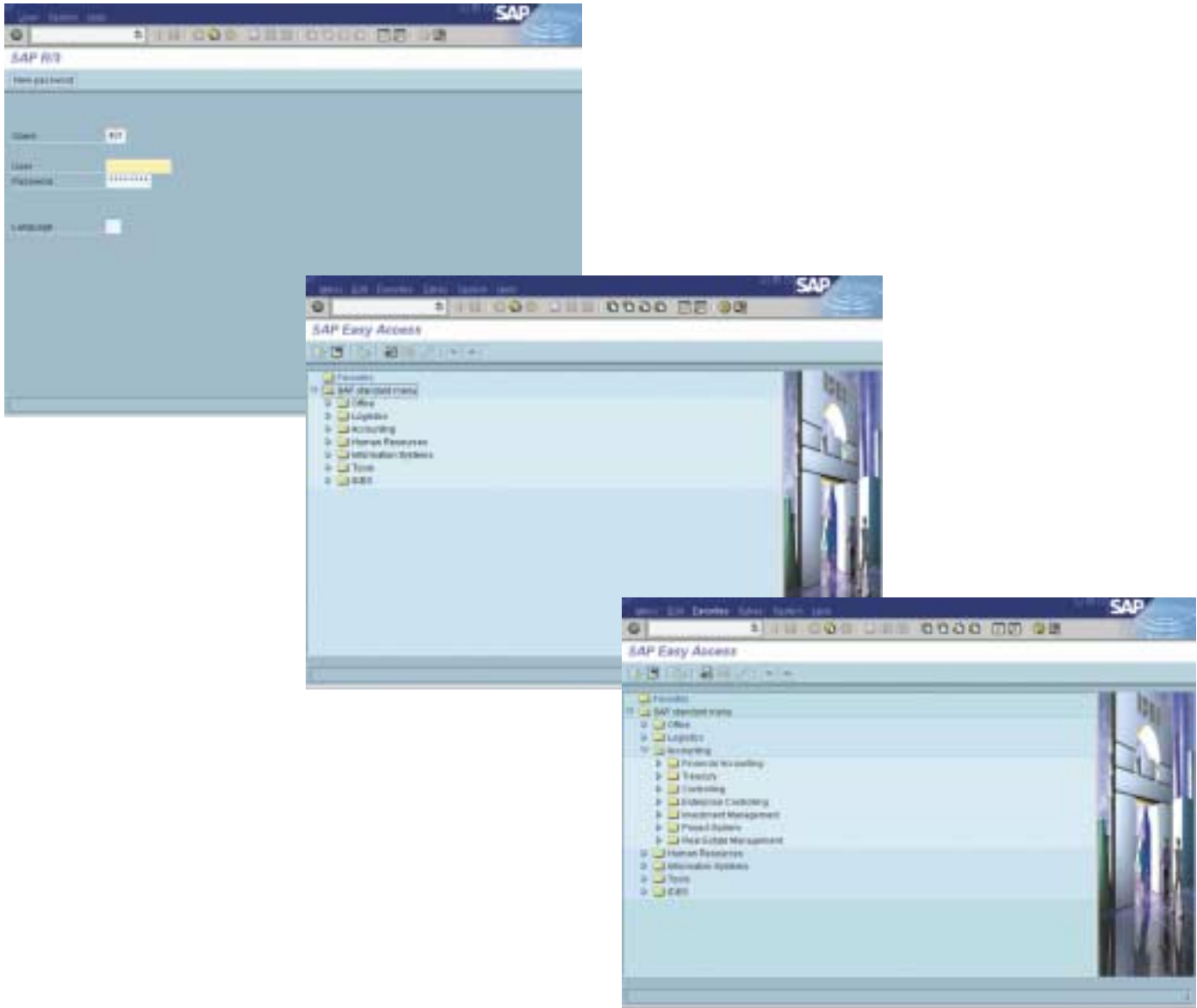
In short, bar code technology is being integrated into all areas of business activity. When combined with EDI or XML, it eliminates a lot of clerical drudgery and allows companies to capture and exchange more data and to analyze and report information much more quickly and completely and with less error than with manual systems.

The integration of XML and the internal computer system for management reporting is called an *enterprise resource planning system* (ERP system). An ERP system represents a real-time computer system using a single uniform database that is coupled with modules for

accounting, logistics, and human resources. Full use of these modules permits an integrated systems response for Internet-based orders in XML, supplier purchases and payables, inventory management, production, sales and receivables, treasury, and capital (fixed) assets management. Major suppliers of such ERP systems include **Oracle**, **SAP**, **Baan**, and **J.D. Edwards**.² Other companies provide certified software that is compatible with these systems. Samples of the overall menus for **SAP** are shown in Exhibit 3–15.

Operationally, these systems can provide global capabilities to regulate the variety of financial accounting and tax situations and do so in the appropriate language. Combining (better known as *consolidation*) of these different reports is performed by the system, along with drill-down capabilities for investigating details.

EXHIBIT 3-15 Sample SAP menus



Copyright 2003 SAP AG.

2. Internet sites for these companies provide details about each of their products and services: <http://www.oracle.com/>, <http://www.sap.com/>, <http://www.baan.com/>, and <http://www.jdedwards.com/>.

Critical to the installation of these systems is a well-specified operating system and well-trained personnel. Configurations for these systems to suit specific industries are provided with the software installation. For example, **SAP**, the world leader in such software, provides configurations for such industries as defence, apparel, automotive, construction, chemicals, and education, to mention only a few.

ERP systems combined with Web-based software and executive decision support reporting represent the current technology used by progressive organizations in both the commercial and not-for-profit fields. The size of an organization has to be sufficient to support the larger systems mentioned here, but small business software is available to do similar activities in an appropriately simplified way.³

INTERNATIONAL JOB COSTING

Studies of the international accounting scene suggest that the general principles of product costing are universally applicable. Nevertheless, differences do exist from country to country in how specific costs are classified. For example, a study of Russian operational accounting and statistical record-keeping, the equivalent of product costing, suggests that the required reporting structure in Russia would assign some cost elements to inventory that we might classify as selling or administrative. Other costs such as the rent on plant facilities would be classified outside of the usual overhead category. If a company was executing a contract with a foreign government, the differences in what is or is not permitted as contract costs would be particularly important. Similarly, what Public Works and Government Services Canada will allow as contract costs is described by the word “prudent” and elaborated in a specific list of costs excluded from product costs.⁴ For example, these requirements would permit certain general and selling costs to be included if a prudent person would incur such costs as part of the contract. Thus, while the general principles may be similar, the specifics can vary as a result of government regulations.

FOCUS on Current Practice

KPMG conducted a detailed 10-month study of international business costs in 11 countries in North America, Europe and Asia-Pacific: *Canada's costs were the lowest recorded by the study* with business costs approximately 9% below those in the United States. The study compared the after-tax costs of start-up and operation for 12 types of business over a 10-year period. Cost components for business such as labour, utilities, transportation, and taxes and 21 others were measured in 98 cities worldwide.

Calgary	91.4	Kelowna	89.7	Toronto	93.2
Charlottown	87.8	Montreal	91.3	Vancouver	93.6
Edmonton	89.2	Ottawa	92.0	Waterloo Region	91.0
Halifax	88.6	Saskatoon	89.4	Winnipeg	90.5

*Business Costs are expressed as an index with the United States given a baseline index of 100.0. A cost index less than 100 indicates lower cost than the U.S. but a cost index greater than 100 indicates a higher cost than the U.S. For example, Halifax, with an index number of 88.6 has a 11.4.0% cost advantage relative to the U.S.

Source: *Competitive Alternatives, the CEO's Guide to International Business Costs*, <http://www.competitivealternatives.com>.

- For background information on ERP, see Gerald Trites, *Enterprise Resource Planning* (Toronto, ON: The Canadian Institute of Chartered Accountants, 2000), and F. Robert Jacobs and D. Clay Whyback, *Why ERP? A Primer on SAP Implementation* (New York, NY: McGraw-Hill/Irwin, 2000).
- Section 3, General Conditions, DSS-MAS 1031-2, “Contract Cost Principles,” *Standard Acquisition Clauses and Conditions Manual*, Public Works and Government Services Canada, 1997.

RECORDED COSTS FOR QUALITY

Deficiencies in quality result in scrap, rework, delays in production, extra inventory, warranty claims, and poor customer relations. Such costs have been estimated at 25% to 35% of total product costs for some companies.

To illustrate the accounting process for defective units, assume that 2,000 units were started for a job, but only 1,900 good units were finished. If raw material, direct labour, and overhead applied amounted to \$4,800 at the end of production, then each good unit would have a unit cost of $\$4,800 \div 1,900$, or \$2.53 per unit. If management wanted to charge the 100 units to all production instead of the particular 1,900-unit job, the situation could be recorded as follows:

Manufacturing Overhead	240
Work in Process Inventory	240

Calculations:

$$\$4,800 \div 2,000 \text{ units} = \$2.40 \text{ per unit}$$

$$100 \text{ defective units would cost } 100 \times \$2.40$$

$$\text{The 1,900 good units would cost } (\$4,800 - \$240) = \$4,560, \text{ or } \$2.40 \text{ per unit.}$$

Any recovery from the 100 units of scrap would be credited to manufacturing overhead or the job costs, depending on the procedure used for the initial recording. If repair or rework was undertaken on the 100 defective units, then material, direct labour, and overhead costs would be charged to the job or the overhead account to be offset by any recovery.

The logic of whether to charge scrap or rework costs to all production or to a specific job is determined by deciding if defect costs were a normal cost of all production (thus a charge to overhead) or a cost of the specific situation surrounding a particular job (thus a charge solely of that job).

Environmentally hazardous scrap or defects can require disposal costs. Such environmental costs can be presented in a manner that they would provide management with evidence of the remediation or disposal requirements for their production processes.

SUMMARY

Job-order costing and process costing are widely used to track costs. Job-order costing is used in situations where the organization offers many different products or services, such as in furniture manufacturing, hospitals, and legal firms. Process costing is used where units of product are homogeneous, such as in flour milling or cement production.

Materials requisition forms and labour time tickets are used to assign direct materials and direct labour costs to jobs in a job-costing system. Manufacturing overhead costs are assigned to jobs through use of a predetermined overhead rate. The predetermined overhead rate is determined before the period begins by dividing the estimated total manufacturing cost for the period by the estimated total allocation base for the period. The most frequently used allocation bases are direct labour-hours and machine-hours. Overhead is applied to jobs by multiplying the predetermined overhead rate by the actual amount of the allocation base used by the job.

Since the predetermined overhead rate is based on estimates, the actual overhead cost incurred during a period may be more or less than the amount of overhead cost applied to production. Such a difference is referred to as under- or overapplied overhead. The under- or overapplied overhead for a period can be (1) closed out to Cost of Goods Sold or

(2) allocated among Work in Process, Finished Goods, and Cost of Goods Sold or (3) carried forward to the end of the year. When overhead is underapplied, manufacturing overhead costs have been understated and therefore inventories and/or expenses must be adjusted upward. When overhead is overapplied, manufacturing overhead costs have been overstated and therefore inventories and/or expenses must be adjusted downward.

REVIEW PROBLEM: JOB-ORDER COSTING

Hogle Company is a manufacturing firm that uses job-order costing. On January 1, the beginning of its fiscal year, the company's inventory balances were as follows:

Raw materials	\$20,000
Work in process	15,000
Finished goods	30,000

The company applies overhead cost to jobs on the basis of machine-hours worked. For the current year, the company estimated that it would work 75,000 machine-hours and incur \$450,000 in manufacturing overhead cost. The following transactions were recorded for the year:

- a. Raw materials were purchased on account, \$410,000.
- b. Raw materials were requisitioned for use in production, \$380,000 (\$360,000 direct materials and \$20,000 indirect materials).
- c. The following costs were incurred for employee services: direct labour, \$75,000; indirect labour, \$110,000; sales commissions, \$90,000; and administrative salaries, \$200,000.
- d. Sales travel costs were incurred, \$17,000.
- e. Utility costs were incurred in the factory, \$43,000.
- f. Advertising costs were incurred, \$180,000.
- g. Depreciation was recorded for the year, \$350,000 (80% relates to factory operations, and 20% relates to selling and administrative activities).
- h. Insurance expired during the year, \$10,000 (70% relates to factory operations, and the remaining 30% relates to selling and administrative activities).
- i. Manufacturing overhead was applied to production. Due to greater than expected demand for its products, the company worked 80,000 machine-hours during the year.
- j. Goods costing \$900,000 to manufacture according to their job cost sheets were completed during the year.
- k. Goods were sold on account to customers during the year at a total selling price of \$1,500,000. The goods cost \$870,000 to manufacture according to their job cost sheets.

Required:

1. Prepare journal entries to record the preceding transactions.
2. Post the entries in (1) above to T-accounts (do not forget to enter the opening balances in the inventory accounts).
3. Is Manufacturing Overhead underapplied or overapplied for the year? Prepare a journal entry to close any balance in the Manufacturing Overhead account to Cost of Goods Sold. Do not allocate the balance between ending inventories and Cost of Goods Sold.
4. Prepare an income statement for the year and a statement of cost of goods manufactured.

Solution to Review Problem

1.	a. Raw Materials	410,000			
	Accounts Payable			410,000	
	b. Work in Process	360,000			
	Manufacturing Overhead	20,000			
	Raw Materials			380,000	
	c. Work in Process	75,000			
	Manufacturing Overhead	110,000			
	Sales Commissions Expense	90,000			
	Administrative Salaries Expense	200,000			
	Salaries and Wages Payable			475,000	

d. Sales Travel Expense	17,000	
Accounts Payable		17,000
e. Manufacturing Overhead	43,000	
Accounts Payable		43,000
f. Advertising Expense	180,000	
Accounts Payable		180,000
g. Manufacturing Overhead	280,000	
Depreciation Expense	70,000	
Accumulated Depreciation		350,000
h. Manufacturing Overhead	7,000	
Insurance Expense	3,000	
Prepaid Insurance		10,000

i. The predetermined overhead rate for the year would be computed as follows:

$$\frac{\text{Estimated manufacturing overhead, \$450,000}}{\text{Estimated machine-hours, 75,000}} = \$6 \text{ per machine-hour}$$

Based on the 80,000 machine-hours actually worked during the year, the company would have applied \$480,000 in overhead cost to production: 80,000 machine-hours × \$6 = \$480,000. The following entry records this application of overhead cost:

Work in Process	480,000	
Manufacturing Overhead		480,000
j. Finished Goods	900,000	
Work in Process		900,000
k. Accounts Receivable	1,500,000	
Sales		1,500,000
Cost of Goods Sold	870,000	
Finished Goods		870,000

2.

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th colspan="2" style="text-align: center;">Accounts Receivable</th></tr> <tr><td style="width: 50%;">(k) 1,500,000</td><td style="width: 50%;"></td></tr> </table>	Accounts Receivable		(k) 1,500,000		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th colspan="2" style="text-align: center;">Manufacturing Overhead</th></tr> <tr><td style="width: 50%;">(b) 20,000</td><td style="width: 50%;">(i) 480,000</td></tr> <tr><td>(c) 110,000</td><td></td></tr> <tr><td>(e) 43,000</td><td></td></tr> <tr><td>(g) 280,000</td><td></td></tr> <tr><td>(h) 7,000</td><td></td></tr> <tr><td style="border-top: 1px dashed black;">460,000</td><td style="border-top: 1px dashed black;">480,000</td></tr> <tr><td style="border-top: 1px dashed black;">Bal. 20,000</td><td></td></tr> </table>	Manufacturing Overhead		(b) 20,000	(i) 480,000	(c) 110,000		(e) 43,000		(g) 280,000		(h) 7,000		460,000	480,000	Bal. 20,000		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th colspan="2" style="text-align: center;">Sales</th></tr> <tr><td style="width: 50%;"></td><td style="width: 50%;">(k) 1,500,000</td></tr> <tr><th colspan="2" style="text-align: center;">Cost of Goods Sold</th></tr> <tr><td style="width: 50%;">(k) 870,000</td><td style="width: 50%;"></td></tr> </table>	Sales			(k) 1,500,000	Cost of Goods Sold		(k) 870,000	
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Advertising Expense																														
(f) 180,000																														

Work in Process		Salaries and Wages Payable		Depreciation Expense	
Bal.	15,000	(j)	900,000	(c)	475,000
(b)	360,000			(g)	70,000
(c)	75,000				
(i)	480,000				

Bal.	30,000				
Finished Goods				Insurance Expense	
Bal.	30,000	(k)	870,000	(h)	3,000
(j)	900,000				

Bal.	60,000				

3. Manufacturing overhead is overapplied for the year. The entry to close it out to Cost of Goods Sold is as follows:

Manufacturing Overhead	20,000	
Cost of Goods Sold		20,000

4.

HOGLE COMPANY
Income Statement
For the Year Ended December 31

Sales	\$1,500,000
Less cost of goods sold (\$870,000 – \$20,000)	<u>850,000</u>
Gross margin	650,000
Less selling and administrative expenses:	
Commissions expense	\$ 90,000
Administrative salaries expense	200,000
Sales travel expense	17,000
Advertising expense	180,000
Depreciation expense	70,000
Insurance expense	<u>3,000</u>
	<u>560,000</u>
Net income	<u>\$ 90,000</u>

HOGLE COMPANY
Schedule of Cost of Goods Manufactured and
Cost of Goods Sold

Direct Materials:		
Raw materials inventory, January 1	\$ 20,000	
Add: Purchases of raw materials	<u>410,000</u>	
Total raw materials available	430,000	
Deduct: Raw materials inventory, December 31	<u>50,000</u>	
Raw materials used in production	380,000	
Less: Indirect materials (below)	<u>20,000</u>	
Direct materials used in production		\$360,000
Direct Labour		75,000
Manufacturing Overhead:		
Indirect materials	20,000	
Indirect labour	110,000	
Utilities	43,000	
Depreciation	280,000	
Insurance	<u>7,000</u>	
Actual overhead costs	460,000	
Add: Overapplied overhead	<u>20,000</u>	

continued

Overhead applied to work in process	480,000*
Total manufacturing costs	915,000
Add: Beginning work in process inventory	15,000
	930,000
Deduct: Ending work in process inventory	30,000
Cost of goods manufactured	900,000
Add: Finished goods inventory, January 1	30,000
Goods available for sale	930,000
Deduct: Finished goods inventory, December 31	60,000
Cost of Goods Sold	870,000
Deduct: Overapplied overhead	20,000
Adjusted cost of goods sold	\$850,000

*The details of manufacturing overhead may be omitted as shown in Exhibit 3–11. If these are not omitted then the overapplied overhead must be added to actual overhead costs and only the total (\$480,000) is added to direct materials and direct labour. The reason is that the schedule of cost of goods manufactured represents a summary of costs flowing through the Work in Process account during a period and therefore must include only overhead applied to production. If a reverse situation had existed and overhead had been underapplied during the period, then the amount of underapplied overhead would have been deducted from actual overhead costs on the schedule. This would have brought the actual overhead costs down to the amount that had been applied to production.

APPENDIX 3A: THE PREDETERMINED OVERHEAD RATE AND CAPACITY

LEARNING OBJECTIVE 8
 Explain the implications of basing the predetermined overhead rate on activity at capacity rather than on estimated activity for the period.

Companies typically base their predetermined overhead rates on the estimated, or budgeted, amount of the allocation base for the upcoming period. This is the method that is used in the chapter, but it is a practice that has recently come under severe criticism. An example will be very helpful in understanding why. Prahad Corporation manufactures music CDs for local recording studios. The company has a CD duplicating machine that is capable of producing a new CD every 10 seconds from a master CD. The company leases the CD duplicating machine for \$180,000 per year, and this is the company’s only manufacturing overhead. With allowances for set-ups and maintenance, the machine is theoretically capable of producing up to 900,000 CDs per year. However, due to weak retail sales of CDs, the company’s commercial customers are unlikely to order more than 600,000 CDs next year. The company uses machine time as the allocation base for applying manufacturing overhead. These data are summarized below:

PRAHAD CORPORATION DATA	
Total manufacturing overhead cost	\$180,000 per year
Allocation base: machine time per CD	10 seconds per CD
Capacity	900,000 CDs per year
Budgeted output for next year	600,000 CDs

If Prahad follows common practice and computes its predetermined overhead rate using estimated, or budgeted, figures, then its predetermined overhead rate for next year would be \$0.03 per second of machine time, computed as follows:

$$\frac{\text{Estimated total manufacturing overhead cost, \$180,000}}{\text{Estimated total units in the allocation base, 600,000 CDs} \times 10 \text{ seconds per CD}} = \$0.03 \text{ per second}$$

Since each CD requires 10 seconds of machine time, each CD will be charged for \$0.30 of overhead cost.

Critics charge that there are two problems with this procedure. First, if predetermined overhead rates are based on budgeted activity, then the unit product costs will fluctuate, depending on the budgeted level of activity for the period. For example, if the budgeted output for the year was only 300,000 CDs, the predetermined overhead rate would be \$0.06 per second of machine time or \$0.60 per CD rather than \$0.30 per CD. In general, if budgeted output falls, the overhead cost per unit will increase; it will appear that the CDs cost more to make. Managers may then be tempted to increase prices at the worst possible time—just as demand is falling.

Second, critics charge that under the traditional approach, products are charged for resources that they do not use. When the fixed costs of capacity are spread over estimated activity, the units that are produced must shoulder the costs of unused capacity. That is why the applied overhead cost per unit increases as the level of activity falls. The critics argue that products should be charged only for the capacity that they use; they should not be charged for the capacity they do not use. This can be accomplished by basing the predetermined overhead rate on capacity as follows:

$$\frac{\text{Total manufacturing overhead cost at capacity, \$180,000}}{\text{Total units in the allocation base at capacity, } 900,000 \text{ CDs} \times 10 \text{ seconds per CD}} = \$0.02 \text{ per second}$$

Since the predetermined overhead rate is \$0.02 per second, the overhead cost applied to each CD would be \$0.20. This charge is constant and would not be affected by the level of activity during a period. If output falls, the charge would still be \$4.00 per CD after adding materials and labour variable costs.

This method will almost certainly result in underapplied overhead. If actual output at Prahad Corporation is 600,000 CDs, then only \$120,000 of overhead cost would be applied to products (\$0.20 per CD \times 600,000 CDs). Since the actual overhead cost is \$180,000, there would be underapplied overhead of \$60,000. In another departure from tradition, the critics suggest that the underapplied overhead that results from idle capacity should be separately disclosed on the income statement as the Cost of Unused Capacity—a period expense. Disclosing this cost as a lump sum on the income statement, rather than burying it in Cost of Goods Sold or ending inventories, makes it much more visible to managers.

Official pronouncements do not prohibit basing predetermined overhead rates on capacity for external reports. Nevertheless, basing the predetermined overhead rate on estimated, or budgeted, activity is a long-established practice in industry, and some managers and accountants may object to the large amounts of underapplied overhead that would often result from using capacity to determine predetermined overhead rates. And some may insist that the underapplied overhead be allocated among Cost of Goods Sold and ending inventories—which would defeat the purpose of basing the predetermined overhead rate on capacity.

GLOSSARY

Visit the Online Learning Centre at <http://www.mcgrawhill.ca/college/garrison/> for a review of key terms and definitions.



QUESTIONS

- 3-1 Why aren't actual overhead costs traced to jobs just as direct materials and direct labour costs are traced to jobs?
- 3-2 When would job-order costing be used in preference to process costing?

- 3-3 What is the purpose of the job cost sheet in a job-order costing system?
- 3-4 What is a predetermined overhead rate, and how is it computed?
- 3-5 Explain how a sales order, a production order, a materials requisition form, and a labour time ticket are involved in producing and costing products.
- 3-6 Explain why some production costs must be assigned to products through an allocation process. Name several such costs. Would such costs be classified as *direct* or as *indirect* costs?
- 3-7 Why do firms use predetermined overhead rates rather than actual manufacturing overhead costs in applying overhead to jobs?
- 3-8 What factors should be considered in selecting a base to be used in computing the predetermined overhead rate?
- 3-9 If a company fully allocates all of its overhead costs to jobs, does this guarantee that a profit will be earned for the period?
- 3-10 What account is credited when overhead cost is applied to Work in Process? Would you expect the amount applied for a period to equal the actual overhead costs of the period? Why or why not?
- 3-11 What is underapplied overhead? Overapplied overhead? What disposition is made of these amounts at period end?
- 3-12 Give two reasons why overhead might be underapplied in a given year.
- 3-13 What adjustment is made for underapplied overhead on the schedule of cost of goods sold? What adjustment is made for overapplied overhead?
- 3-14 Sigma Company applies overhead cost to jobs on the basis of direct labour cost. Job A, which was started and completed during the current period, shows charges of \$5,000 for direct materials, \$8,000 for direct labour, and \$6,000 for overhead on its job cost sheet. Job B, which is still in process at year-end, shows charges of \$2,500 for direct materials and \$4,000 for direct labour. Should any overhead cost be added to job B at year-end? Explain.
- 3-15 A company assigns overhead cost to completed jobs on the basis of 125% of direct labour cost. The job cost sheet for job 313 shows that \$10,000 in direct materials has been used on the job and that \$12,000 in direct labour cost has been incurred. If 1,000 units were produced in job 313, what is the cost per unit?
- 3-16 What is a plantwide overhead rate? Why are multiple overhead rates, rather than a plantwide rate, used in some companies?
- 3-17 What happens to overhead rates based on direct labour when automated equipment replaces direct labour?
- 3-18 Predetermined overhead rates smooth product costs. Do you agree? Why?
- 3-19 Explain clearly the rationale for why under- and overapplied overhead for an interim period should be carried to the balance sheet. What conceptual factor is assumed in the argument?
- 3-20 Why does the calculation of the percentages for prorating the under- or overapplied overhead reduce the costs of goods sold by the opening inventories? What would happen if such a deduction was not made?
- 3-21 (Appendix A) If the plant is operated at less than capacity and the predetermined overhead rate is based on the estimated total units in the allocation base at capacity, will overhead ordinarily be overapplied or underapplied?
- 3-22 (Appendix A) Rather than netting underapplied overhead against Cost of Goods Sold or Cost of Goods Sold and ending inventories, some critics suggest an alternative way to disclose underapplied overhead. What is this alternative method?

EXERCISES

EXERCISE 3-1 Process Costing and Job-Order Costing [LO1]

Which method of determining product costs, job-order costing or process costing, would be more appropriate in each of the following situations?

- An Elmer's glue factory.
- A textbook publisher such as McGraw-Hill Ryerson.
- An Exxon oil refinery.
- A facility that makes Minute Maid frozen orange juice.
- A Scott paper mill.
- A custom home builder.
- A shop that customizes vans.

- h. A manufacturer of specialty chemicals.
- i. An auto repair shop.
- j. A Firestone tire manufacturing plant.
- k. An advertising agency.
- l. A law office.

EXERCISE 3–2 Job-Order Costing Documents [LO2]

Cycle Gear Corporation has incurred the following costs on job number W456, an order for 20 special sprockets to be delivered at the end of next month.

Direct materials:

On April 10, requisition number 15673 was issued for 20 titanium blanks to be used in the special order. The blanks cost \$15.00 each.

On April 11, requisition number 15678 was issued for 480 hardened nibs also to be used in the special order. The nibs cost \$1.25 each.

Direct labour:

On April 12, Jamie Unser worked from 11:00 AM until 2:45 PM on Job W456. He is paid \$9.60 per hour.

On April 18, Melissa Chan worked from 8:15 AM until 11:30 AM on Job W456. She is paid \$12.20 per hour.

Required:

1. On what documents would these costs be recorded?
2. How much cost should have been recorded on each of the documents for Job W456?

EXERCISE 3–3 Compute the Predetermined Overhead Rate [LO3]

Harris Fabrics computes its predetermined overhead rate annually on the basis of direct labour-hours. At the beginning of the year it estimated that its total manufacturing overhead would be \$134,000 and the total direct labour would be 20,000 hours. Its actual total manufacturing overhead for the year was \$123,900 and its actual total direct labour was 21,000 hours.

Required:

Compute the company's predetermined overhead rate for the year.

EXERCISE 3–4 Prepare Journal Entries [LO4]

Larned Corporation recorded the following transactions for the just completed month.

- a. \$80,000 in raw materials were purchased on account.
- b. \$71,000 in raw materials were requisitioned for use in production. Of this amount, \$62,000 was for direct materials and the remainder was for indirect materials.
- c. Total labour wages of \$112,000 were incurred. Of this amount, \$101,000 was for direct labour and the remainder was for indirect labour.
- d. Additional manufacturing overhead costs of \$175,000 were incurred.

Required:

Record the above transactions in journal entries.

EXERCISE 3–5 Apply Overhead [LO5]

Luthan Company uses a predetermined overhead rate of \$23.40 per direct labour-hour. This predetermined rate was based on 11,000 estimated direct labour-hours and \$257,400 of estimated total manufacturing overhead.

The company incurred actual total manufacturing overhead costs of \$249,000 and 10,800 total direct labour-hours during the period.

Required:

Determine the amount of manufacturing overhead that would have been applied to units of product during the period.

EXERCISE 3–6 Applying Overhead; Cost of Goods Manufactured [LO5, LO6, LO8]

The following cost data relate to the manufacturing activities of Chang Company during the just completed year:

The company uses a predetermined overhead rate to apply overhead cost to production. The rate for the year was \$25 per machine-hour. A total of 19,400 machine-hours was recorded for the year.

Manufacturing overhead costs incurred:	
Indirect materials	\$15,000
Indirect labour	130,000
Property taxes, factory	8,000
Utilities, factory	70,000
Depreciation, factory	240,000
Insurance, factory	10,000
Total actual manufacturing overhead costs incurred	<u>\$473,000</u>
Other costs incurred:	
Purchases of raw materials (both direct and indirect)	\$400,000
Direct labour cost	\$60,000
Inventories:	
Raw materials, beginning	\$20,000
Raw materials, ending	\$30,000
Work in process, beginning	\$40,000
Work in process, ending	\$70,000

Required:

1. Compute the amount of under- or overapplied overhead cost for the year.
2. Prepare a schedule of cost of goods manufactured for the year.

EXERCISE 3-7 Prepare T-Accounts [LO7, LO8]

Jurvin Enterprises recorded the following transactions for the just completed month. The company had no beginning inventories.

- a. \$94,000 in raw materials were purchased for cash.
- b. \$89,000 in raw materials were requisitioned for use in production. Of this amount, \$78,000 was for direct materials and the remainder was for indirect materials.
- c. Total labour wages of \$132,000 were incurred and paid. Of this amount, \$112,000 was for direct labour and the remainder was for indirect labour.
- d. Additional manufacturing overhead costs of \$143,000 were incurred and paid.
- e. Manufacturing overhead costs of \$152,000 were applied to jobs using the company's predetermined overhead rate.
- f. All of the jobs in progress at the end of the month were completed and shipped to customers.
- g. The underapplied or overapplied overhead for the period was closed out to Cost of Goods Sold.

Required:

1. Post the above transactions to T-accounts.
2. Determine the cost of goods sold for the period.

EXERCISE 3-8 Under- and Overapplied Overhead [LO8]

Osborn Manufacturing uses a predetermined overhead rate of \$18.20 per direct labour-hour. This predetermined rate was based on 12,000 estimated direct labour-hours and \$218,400 of estimated total manufacturing overhead.

The company incurred actual total manufacturing overhead costs of \$215,000 and 11,500 total direct labour-hours during the period.

Required:

1. Determine the amount of underapplied or overapplied manufacturing overhead for the period.
2. Assuming that the entire amount of the underapplied or overapplied overhead is closed out to Cost of Goods Sold, what would be the effect of the underapplied or overapplied overhead on the company's gross margin for the period?

EXERCISE 3-9 Departmental Overhead Rates [LO2, LO3, LO5]

White Company has two departments, Cutting and Finishing. The company uses a job-order cost system and computes a predetermined overhead rate in each department. The Cutting Department bases its rate on machine-hours, and the Finishing Department bases its rate on direct labour cost. At the beginning of the year, the company made the following estimates:



	Department	
	Cutting	Finishing
Direct labour-hours	6,000	30,000
Machine-hours	48,000	5,000
Manufacturing overhead cost	\$360,000	\$486,000
Direct labour cost	\$50,000	\$270,000

Required:

1. Compute the predetermined overhead rate to be used in each department.
2. Assume that the overhead rates that you computed in (1) above are in effect. The job cost sheet for Job 203, which was started and completed during the year, showed the following:

	Department	
	Cutting	Finishing
Direct labour-hours	6	20
Machine-hours	80	4
Materials requisitioned	\$500	\$310
Direct labour cost	\$70	\$150

Compute the total overhead cost applied to Job 203.

3. Would you expect substantially different amounts of overhead cost to be assigned to some jobs if the company used a plantwide overhead rate based on direct labour cost, rather than using departmental rates? Explain. No computations are necessary.

EXERCISE 3–10 Journal Entries and T-accounts [LO4, LO5, LO7]

The Polaris Company uses a job-order costing system. The following data relate to October, the first month of the company’s fiscal year.

- a. Raw materials purchased on account, \$210,000.
- b. Raw materials issued to production, \$190,000 (\$178,000 direct materials and \$12,000 indirect materials).
- c. Direct labour cost incurred, \$90,000; indirect labour cost incurred, \$110,000.
- d. Depreciation recorded on factory equipment, \$40,000.
- e. Other manufacturing overhead costs incurred during October, \$70,000 (credit Accounts Payable).
- f. The company applies manufacturing overhead cost to production on the basis of \$8 per machine-hour. There were 30,000 machine-hours recorded for October.
- g. Production orders costing \$520,000 according to their job cost sheets were completed during October and transferred to Finished Goods.
- h. Production orders that had cost \$480,000 to complete according to their job cost sheets were shipped to customers during the month. These goods were sold on account at 25% above cost.

Required:

1. Prepare journal entries to record the information given above.
2. Prepare T-accounts for Manufacturing Overhead and Work in Process. Post the relevant information above to each account. Compute the ending balance in each account, assuming that Work in Process has a beginning balance of \$42,000.

EXERCISE 3–11 Applying Overhead in a Service Company [LO2, LO3, LO5]

Leeds Architectural Consultants began operations on January 2. The following activity was recorded in the company’s Work in Process account for the first month of operations:

Work in Process			
Costs of subcontracted work	230,000	To completed projects	390,000
Direct staff costs	75,000		
Studio overhead	120,000		



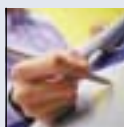
Leeds Architectural Consultants is a service firm, so the names of the accounts it uses are different from the names used in manufacturing firms. Costs of Subcontracted Work is comparable to Direct Materials; Direct Staff Costs is the same as Direct Labour; Studio Overhead is the same as Manufacturing Overhead; and Completed Projects is the same as Finished Goods. Apart from the difference in terms, the accounting methods used by the company are identical to the methods used by manufacturing companies.

Leeds Architectural Consultants uses a job-order costing system and applies studio overhead to Work in Process on the basis of direct staff costs. At the end of January, only one job was still in process. This job (Lexington Gardens Project) had been charged with \$6,500 in direct staff costs.

Required:

1. Compute the predetermined overhead rate that was in use during January.
2. Complete the following job cost sheet for the partially completed Lexington Gardens Project.

Job Cost Sheet—Lexington Gardens Project	
As of January 31	
Costs of subcontracted work	\$?
Direct staff costs	?
Studio overhead	?
Total cost to January 31	<u>\$?</u>



EXERCISE 3–12 Varying Predetermined Overhead Rates [LO3, LO5]

Kingsport Containers, Ltd, of the Bahamas experiences wide variation in demand for the 200-litre steel drums it fabricates. The leakproof, rustproof steel drums have a variety of uses from storing liquids and bulk materials to serving as makeshift musical instruments. The drums are made to order and are painted according to the customer’s specifications—often in bright patterns and designs. The company is well known for the artwork that appears on its drums. Unit product costs are computed on a quarterly basis by dividing each quarter’s manufacturing costs (materials, labour, and overhead) by the quarter’s production in units. The company’s estimated costs, by quarter, for the coming year follow:

	Quarter			
	First	Second	Third	Fourth
Direct materials	\$240,000	\$120,000	\$60,000	\$180,000
Direct labour	128,000	64,000	32,000	96,000
Manufacturing overhead	300,000	220,000	180,000	260,000
Total manufacturing costs	<u>\$668,000</u>	<u>\$404,000</u>	<u>\$272,000</u>	<u>\$536,000</u>
Number of units to be produced	80,000	40,000	20,000	60,000
Estimated unit product cost	\$8.35	\$10.10	\$13.60	\$8.93

Management finds the variation in unit costs to be confusing and difficult to work with. It has been suggested that the problem lies with manufacturing overhead, since it is the largest element of cost. Accordingly, you have been asked to find a more appropriate way of assigning manufacturing overhead cost to units of product. After some analysis, you have determined that the company’s overhead costs are mostly fixed and therefore show little sensitivity to changes in the level of production.

Required:

1. The company uses a job-order costing system. How would you recommend that manufacturing overhead cost be assigned to production? Be specific, and show computations.
2. Recompute the company’s unit product costs in accordance with your recommendations in (1) above.



EXERCISE 3–13 Applying Overhead; T-accounts; Journal Entries [LO3, LO4, LO5, LO7, LO8]

Harwood Company is a manufacturer that operates a job-order costing system. Overhead costs are applied to jobs on the basis of machine-hours. At the beginning of the year, management estimated that the company would incur \$192,000 in manufacturing overhead costs and work 80,000 machine-hours.

Required:

1. Compute the company's predetermined overhead rate.
2. Assume that during the year the company works only 75,000 machine-hours and incurs the following costs in the Manufacturing Overhead and Work in Process accounts:

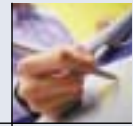
Manufacturing Overhead			Work in Process		
(Maintenance)	21,000	?	(Direct materials)	710,000	
(Indirect materials)	8,000		(Direct labour)	90,000	
(Indirect labour)	60,000		(Overhead)	?	
(Utilities)	32,000				
(Insurance)	7,000				
(Depreciation)	56,000				

Copy the data in the T-accounts above onto your answer sheet. Compute the amount of overhead cost that would be applied to Work in Process for the year and make the entry in your T-accounts.

3. Compute the amount of under- or overapplied overhead for the year and show the balance in your Manufacturing Overhead T-account. Prepare a journal entry to close out the balance in this account to Cost of Goods Sold.
4. Explain why the manufacturing overhead was under- or overapplied for the year.

EXERCISE 3-14 Applying Overhead; Journal Entries; Disposition of Underapplied or Overapplied Overhead [LO4, LO7, LO8]

The following information is taken from the accounts of Latta Company. The entries in the T-accounts are summaries of the transactions that affected those accounts during the year.



Manufacturing Overhead		Work in Process	
(a) 460,000	(b) 390,000	Bal. 15,000	(c) 710,000
Bal. 70,000		260,000	
		85,000	
		(b) 390,000	
		Bal. 40,000	

Finished Goods		Cost of Goods Sold	
Bal. 50,000	(d) 640,000	(d) 640,000	
(c) 710,000			
Bal. 120,000			

The overhead that had been applied to production during the year is distributed among the ending balances in the accounts as follows:

Work in Process, ending	\$ 19,500
Finished Goods, ending	58,500
Cost of Goods Sold	312,000
Overhead applied	<u>\$390,000</u>

For example, of the \$40,000 ending balance in Work in Process, \$19,500 was overhead that had been applied during the year.

Required:

1. Identify reasons for entries (a) through (d).
2. Assume that the company closes any balance in the Manufacturing Overhead account directly to Cost of Goods Sold. Prepare the necessary journal entry.
3. Assume instead that the company allocates any balance in the Manufacturing Overhead account to the other accounts in proportion to the overhead applied in their ending balances. Prepare the necessary journal entry, with supporting computations.

EXERCISE 3–15 Applying Overhead; Journal Entries; T-accounts [LO3, LO4, LO5, LO7]

Dillon Products manufactures various machined parts to customer specifications. The company uses a job-order costing system and applies overhead cost to jobs on the basis of machine-hours. At the beginning of the year, it was estimated that the company would work 240,000 machine-hours and incur \$4,800,000 in manufacturing overhead costs.

The company spent the entire month of January working on a large order for 16,000 custom-made machined parts. The company had no work in process at the beginning of January. Cost data relating to January follow:

- Raw materials purchased on account, \$325,000.
- Raw materials requisitioned for production, \$290,000 (80% direct materials and 20% indirect materials).
- Labour cost incurred in the factory, \$180,000 (one-third direct labour and two-thirds indirect labour).
- Depreciation recorded on factory equipment, \$75,000.
- Other manufacturing overhead costs incurred, \$62,000 (credit Accounts Payable).
- Manufacturing overhead cost was applied to production on the basis of 15,000 machine-hours actually worked during the month.
- The completed job was moved into the finished goods warehouse on January 31 to await delivery to the customer. (In computing the dollar amount for this entry, remember that the cost of a completed job consists of direct materials, direct labour, and *applied* overhead.)

Required:

- Prepare journal entries to record items (a) through (f) above [ignore item (g) for the moment].
- Prepare T-accounts for Manufacturing Overhead and Work in Process. Post the relevant items from your journal entries to these T-accounts.
- Prepare a journal entry for item (g) above.
- Compute the unit product cost that will appear on the job cost sheet.

**EXERCISE 3–16 (Appendix 3A) Overhead Rates and Capacity Issues [LO3, LO5, LO8, LO9]**

Security Pension Services helps clients to set up and administer pension plans that are in compliance with tax laws and regulatory requirements. The firm uses a job-order costing system in which overhead is applied to clients' accounts on the basis of professional staff hours charged to the accounts. Data concerning two recent years appear below:

	2005	2004
Estimated professional staff hours to be charged to clients' accounts	4,600	4,500
Estimated overhead cost	\$310,500	\$310,500
Professional staff hours available	6,000	6,000

“Professional staff hours available” is a measure of the capacity of the firm. Any hours available that are not charged to clients' accounts represent unused capacity.

Required:

- Marta Brinksi is an established client whose pension plan was set up many years ago. In both 2004 and 2005, only 2.5 hours of professional staff time were charged to Ms. Brinksi's account. If the company bases its predetermined overhead rate on the estimated overhead cost and the estimated professional staff hours to be charged to clients, how much overhead cost would have been applied to Ms. Brinksi's account in 2004? In 2005?
- Suppose that the company bases its predetermined overhead rate on the estimated overhead cost and the estimated professional staff hours to be charged to clients as in (1) above. Also suppose that the actual professional staff hours charged to clients' accounts and the actual overhead costs turn out to be exactly as estimated in both years. By how much would the overhead be under- or overapplied in 2004? In 2005?
- Refer back to the data concerning Ms. Brinksi in (1) above. If the company bases its predetermined overhead rate on the estimated overhead cost and the *professional staff hours available*, how much overhead cost would have been applied to Ms. Brinksi's account in 2004? In 2005?
- Suppose that the company bases its predetermined overhead rate on the estimated overhead cost and the professional staff hours available as in (3) above. Also suppose that the actual

professional staff hours charged to clients' accounts and the actual overhead costs turn out to be exactly as estimated in both years. By how much would the overhead be under- or overapplied in 2004? In 2005?

EXERCISE 3–17 Applying Overhead in a Service Company; Journal Entries [LO4, LO5, LO8]

Vista Landscaping uses a job-order costing system to track the costs of its landscaping projects. The company provides garden design and installation services for its clients. The table below provides data concerning the three landscaping projects that were in progress during April. There was no work in process at the beginning of April.

	Project		
	Harris	Chan	James
Designer-hours	120	100	90
Direct materials cost	\$4,500	\$3,700	\$1,400
Direct labour cost	\$9,600	\$8,000	\$7,200

Actual overhead costs were \$30,000 for April. Overhead costs are applied to projects on the basis of designer-hours since most of the overhead is related to the costs of the garden design studio. The predetermined overhead rate is \$90 per designer-hour. The Harris and Chan projects were completed in April; the James project was not completed by the end of the month.

Required:

1. Compute the amount of overhead cost that would have been charged to each project during April.
2. Prepare a journal entry showing the completion of the Harris and Chan projects and the transfer of costs to the Completed Projects (i.e., Finished Goods) account.
3. What is the balance in the Work in Process account at the end of the month?
4. What is the balance in the Overhead account at the end of the month? What is this balance called?



PROBLEMS

PROBLEM 3–18 Comprehensive Problem [LO3, LO4, LO5, LO7, LO8]

Gold Nest Company of Guandong, China, is a family-owned enterprise that makes birdcages for the South China market. A popular pastime among older Chinese men is to take their pet birds on daily excursions to teahouses and public parks where they meet with other bird owners to talk and play mahjong. A great deal of attention is lavished on these birds, and the birdcages are often elaborately constructed from exotic woods and contain porcelain feeding bowls and silver roosts. Gold Nest Company makes a broad range of birdcages that it sells through an extensive network of street vendors who receive commissions on their sales. The Chinese currency is the renminbi, which is denoted by Rmb. All of the company's transactions with customers, employees, and suppliers are conducted in cash; there is no credit.

The company uses a job-order costing system in which overhead is applied to jobs on the basis of direct labour cost. At the beginning of the year, it was estimated that the total direct labour cost for the year would be Rmb200,000 and the total manufacturing overhead cost would be Rmb330,000. At the beginning of the year, the inventory balances were as follows:

Raw materials	Rmb25,000
Work in process	Rmb10,000
Finished goods	Rmb40,000

During the year, the following transactions were completed:

- a. Raw materials purchased for cash, Rmb275,000.
- b. Raw materials requisitioned for use in production, Rmb280,000 (materials costing Rmb220,000 were charged directly to jobs; the remaining materials were indirect).
- c. Costs for employee services were incurred as follows:

Direct labour	Rmb180,000
Indirect labour	Rmb72,000
Sales commissions	Rmb63,000
Administrative salaries	Rmb90,000

- d. Rent for the year was Rmb18,000 (Rmb13,000 of this amount related to factory operations, and the remainder related to selling and administrative activities).
- e. Utility costs incurred in the factory, Rmb57,000.
- f. Advertising costs incurred, Rmb140,000.
- g. Depreciation recorded on equipment, Rmb100,000. (Rmb88,000 of this amount was on equipment used in factory operations; the remaining Rmb12,000 was on equipment used in selling and administrative activities.)
- h. Manufacturing overhead cost was applied to jobs, Rmb ____?
- i. Goods that had cost Rmb675,000 to manufacture according to their job cost sheets were completed during the year.
- j. Sales for the year totalled Rmb1,250,000. The total cost to manufacture these goods according to their job cost sheets was Rmb700,000.

Required:

1. Prepare journal entries to record the transactions for the year.
2. Prepare T-accounts for inventories, Manufacturing Overhead, and Cost of Goods Sold. Post relevant data from your journal entries to these T-accounts (don't forget to enter the beginning balances in your inventory accounts). Compute an ending balance in each account.
3. Is Manufacturing Overhead underapplied or overapplied for the year? Prepare a journal entry to close any balance in the Manufacturing Overhead account to Cost of Goods Sold.
4. Prepare an income statement for the year. (Do not prepare a schedule of cost of goods manufactured; all of the information needed for the income statement is available in the journal entries and T-accounts you have prepared.)



PROBLEM 3–19 Cost Flows; T-Accounts; Income Statement [LO3, LO5, LO6, LO7, LO8]
Supreme Videos, Inc., produces short musical videos for sale to retail outlets. The company's balance sheet accounts as of January 1, the beginning of its fiscal year, are given below.

SUPREME VIDEOS, INC.		
Balance Sheet		
January 1		
Assets		
Current assets:		
Cash		\$ 63,000
Accounts receivable		102,000
Inventories:		
Raw materials (film, costumes)	\$ 30,000	
Videos in process	45,000	
Finished videos awaiting sale	<u>81,000</u>	156,000
Prepaid insurance		<u>9,000</u>
Total current assets		330,000
Studio and equipment	730,000	
Less accumulated depreciation	<u>210,000</u>	<u>520,000</u>
Total assets		<u><u>\$850,000</u></u>
Liabilities and Shareholders' Equity		
Accounts payable		\$160,000
Capital stock	\$420,000	
Retained earnings	<u>270,000</u>	<u>690,000</u>
Total liabilities and shareholders' equity		<u><u>\$850,000</u></u>

Since the videos differ in length and in complexity of production, the company uses a job-order costing system to determine the cost of each video produced. Studio (manufacturing) over-

head is charged to videos on the basis of camera-hours of activity. At the beginning of the year, the company estimated that it would work 7,000 camera-hours and incur \$280,000 in studio overhead cost. The following transactions were recorded for the year:

- a. Film, costumes, and similar raw materials purchased on account, \$185,000.
- b. Film, costumes, and other raw materials issued to production, \$200,000 (85% of this material was considered direct to the videos in production, and the other 15% was considered indirect).
- c. Utility costs incurred in the production studio, \$72,000.
- d. Depreciation recorded on the studio, cameras, and other equipment, \$84,000. Three-fourths of this depreciation related to actual production of the videos, and the remainder related to equipment used in marketing and administration.
- e. Advertising expense incurred, \$130,000.
- f. Costs for salaries and wages were incurred as follows:

Direct labour (actors and directors)	\$82,000
Indirect labour (carpenters to build sets, costume designers, and so forth)	\$110,000
Administrative salaries	\$95,000

- g. Prepaid insurance expired during the year, \$7,000 (80% related to production of videos, and 20% related to marketing and administrative activities).
- h. Miscellaneous marketing and administrative expenses incurred, \$8,600.
- i. Studio (manufacturing) overhead was applied to videos in production. The company recorded 7,250 camera-hours of activity during the year.
- j. Videos that cost \$550,000 to produce according to their job cost sheets were transferred to the finished videos warehouse to await sale and shipment.
- k. Sales for the year totalled \$925,000 and were all on account. The total cost to produce these videos according to their job cost sheets was \$600,000.
- l. Collections from customers during the year totalled \$850,000.
- m. Payments to suppliers on account during the year, \$500,000; payments to employees for salaries and wages, \$285,000.

Required:

1. Prepare a T-account for each account on the company's balance sheet and enter the beginning balances.
2. Record the transactions directly into the T-accounts. Prepare new T-accounts as needed. Key your entries to the letters (a) through (m) above. Find the ending balance in each account.
3. Is the Studio (manufacturing) Overhead account underapplied or overapplied for the year? Make an entry in the T-accounts to close any balance in the Studio Overhead account to Cost of Goods Sold.
4. Prepare an income statement for the year. (Do not prepare a schedule of cost of goods manufactured; all of the information needed for the income statement is available in the T-accounts.)

PROBLEM 3–20 Journal Entries; T-Accounts; Cost Flows [LO4, LO5, LO7]

Almeda Products, Inc., uses a job-order costing system. The company's inventory balances on April 1, the start of its fiscal year, were as follows:

Raw materials	\$32,000
Work in process	\$20,000
Finished goods	\$48,000

During the year, the following transactions were completed:

- a. Raw materials were purchased on account, \$170,000.
- b. Raw materials were issued from the storeroom for use in production, \$180,000 (80% direct and 20% indirect).
- c. Employee salaries and wages were accrued as follows: direct labour, \$200,000; indirect labour, \$82,000; and selling and administrative salaries, \$90,000.
- d. Utility costs were incurred in the factory, \$65,000.
- e. Advertising costs were incurred, \$100,000.
- f. Prepaid insurance expired during the year, \$20,000 (90% related to factory operations, and 10% related to selling and administrative activities).
- g. Depreciation was recorded, \$180,000 (85% related to factory assets, and 15% related to selling and administrative assets).
- h. Manufacturing overhead was applied to jobs at the rate of 175% of direct labour cost.

- i. Goods that cost \$700,000 to manufacture according to their job cost sheets were transferred to the finished goods warehouse.
- j. Sales for the year totalled \$1,000,000 and were all on account. The total cost to manufacture these goods according to their job cost sheets was \$720,000.

Required:

- 1. Prepare journal entries to record the transactions for the year.
- 2. Prepare T-accounts for Raw Materials, Work in Process, Finished Goods, Manufacturing Overhead, and Cost of Goods Sold. Post the appropriate parts of your journal entries to these T-accounts. Compute the ending balance in each account. (Don't forget to enter the beginning balances in the inventory accounts.)
- 3. Is Manufacturing Overhead underapplied or overapplied for the year? Prepare a journal entry to close this balance to Cost of Goods Sold.
- 4. Prepare an income statement for the year. (Do not prepare a schedule of cost of goods manufactured; all of the information needed for the income statement is available in the journal entries and T-accounts you have prepared.)

PROBLEM 3–21 T-accounts; Applying Overhead [LO5, LO7, LO8]

Hudson Company's trial balance as of January 1, the beginning of its fiscal year, is given below:

Cash	\$ 7,000	
Accounts Receivable	18,000	
Raw Materials	9,000	
Work in Process	20,000	
Finished Goods	32,000	
Prepaid Insurance	4,000	
Plant and Equipment	210,000	
Accumulated Depreciation		\$ 53,000
Accounts Payable		38,000
Capital Stock		160,000
Retained Earnings		49,000
Total	\$300,000	\$300,000

Hudson Company is a manufacturer that uses a job-order costing system. During the year, the following transactions took place:

- a. Raw materials purchased on account, \$40,000.
- b. Raw materials were requisitioned for use in production, \$38,000 (85% direct and 15% indirect).
- c. Factory utility costs incurred, \$19,100.
- d. Depreciation was recorded on plant and equipment, \$36,000. Three-fourths of the depreciation related to factory equipment, and the remainder related to selling and administrative equipment.
- e. Advertising expense incurred, \$48,000.
- f. Costs for salaries and wages were incurred as follows:

Direct labour	\$45,000
Indirect labour	\$10,000
Administrative salaries	\$30,000

- g. Prepaid insurance expired during the year, \$3,000 (80% related to factory operations, and 20% related to selling and administrative activities).
- h. Miscellaneous selling and administrative expenses incurred, \$9,500.
- i. Manufacturing overhead was applied to production. The company applies overhead on the basis of \$8 per machine-hour; 7,500 machine-hours were recorded for the year.
- j. Goods that cost \$140,000 to manufacture according to their job cost sheets were transferred to the finished goods warehouse.
- k. Sales for the year totalled \$250,000 and were all on account. The total cost to manufacture these goods according to their job cost sheets was \$130,000.
- l. Collections from customers during the year totalled \$245,000.
- m. Payments to suppliers on account during the year, \$150,000; payments to employees for salaries and wages, \$84,000.

Required:

- 1. Prepare a T-account for each account in the company's trial balance and enter the opening balances shown above.

- Record the transactions above directly into the T-accounts. Prepare new T-accounts as needed. Key your entries to the letters (a) through (m) above. Find the ending balance in each account.
- Is manufacturing overhead underapplied or overapplied for the year? Make an entry in the T-accounts to close any balance in the Manufacturing Overhead account to Cost of Goods Sold.
- Prepare an income statement for the year. (Do not prepare a schedule of cost of goods manufactured; all of the information needed for the income statement is available in the T-accounts.)

PROBLEM 3–22 T-accounts; Overhead Rates; Journal Entries [LO2, LO3, LO4, LO5, LO7]

AOZT Volzhskije Motory of St. Petersburg, Russia, makes marine motors for vessels ranging in size from harbour tugs to open-water icebreakers. (The Russian currency is the ruble, which is denoted by RUR. All currency amounts below are in thousands of RUR.)

The company uses a job-order costing system. Only three jobs—Job 208, Job 209, and Job 210—were worked on during May and June. Job 208 was completed on June 20; the other two jobs were uncompleted on June 30. Job cost sheets on the three jobs are given below:

	Job Cost Sheet		
	Job 208	Job 209	Job 210
May costs incurred:*			
Direct materials	RUR9,500	RUR5,100	RUR —
Direct labour	RUR8,000	RUR3,000	RUR —
Manufacturing overhead	RUR11,200	RUR4,200	RUR —
June costs incurred:			
Direct materials	RUR —	RUR6,000	RUR7,200
Direct labour	RUR4,000	RUR7,500	RUR8,500
Manufacturing overhead	RUR ?	RUR ?	RUR ?

*Jobs 208 and 209 were started during May.

The following additional information is available:

- Manufacturing overhead is applied to jobs on the basis of direct labour cost.
- Balances in the inventory accounts at May 31 were:

Raw Materials	RUR30,000
Work in Process	RUR?
Finished Goods	RUR50,000

Required:

- Prepare T-accounts for Raw Materials, Work in Process, Finished Goods, and Manufacturing Overhead. Enter the May 31 balances given above; in the case of Work in Process, compute the May 31 balance and enter it into the Work in Process T-account.
- Prepare journal entries for *June* as follows:
 - Prepare an entry to record the issue of materials into production and post the entry to appropriate T-accounts. (In the case of direct materials, it is not necessary to make a separate entry for each job.) Indirect materials used during June totalled RUR3,600.
 - Prepare an entry to record the incurrence of labour cost and post the entry to appropriate T-accounts. (In the case of direct labour cost, it is not necessary to make a separate entry for each job.) Indirect labour cost totalled RUR7,000 for June.
 - Prepare an entry to record the incurrence of RUR19,400 in various actual manufacturing overhead costs for June. (Credit Accounts Payable.) Post this entry to the appropriate T-accounts.
- What apparent predetermined overhead rate does the company use to assign overhead cost to jobs? Using this rate, prepare a journal entry to record the application of overhead cost to jobs for June (it is not necessary to make a separate entry for each job). Post this entry to appropriate T-accounts.
- As stated earlier, Job 208 was completed during June. Prepare a journal entry to show the transfer of this job off of the production line and into the finished goods warehouse. Post the entry to appropriate T-accounts.
- Determine the balance at June 30 in the Work in Process inventory account. How much of this balance consists of costs charged to Job 209? To Job 210?

PROBLEM 3–23 Multiple Departments; Applying Overhead [LO3, LO5, LO8]

High Desert Potteryworks makes a variety of pottery products that it sells to retailers such as Home Depot. The company uses a job-order costing system in which predetermined overhead rates are used to apply manufacturing overhead cost to jobs. The predetermined overhead rate in the Molding Department is based on machine-hours, and the rate in the Painting Department is based on direct labour cost. At the beginning of the year, the company’s management made the following estimates:

	Department	
	Molding	Painting
Direct labour-hours	12,000	60,000
Machine-hours	70,000	8,000
Direct materials cost	\$510,000	\$650,000
Direct labour cost	\$130,000	\$420,000
Manufacturing overhead cost	\$602,000	\$735,000

Job 205 was started on August 1 and completed on August 10. The company’s cost records show the following information concerning the job:

	Department	
	Molding	Painting
Direct labour-hours	30	85
Machine-hours	110	20
Materials placed into production	\$470	\$332
Direct labour cost	\$290	\$680

Required:

1. Compute the predetermined overhead rate used during the year in the Molding Department. Compute the rate used in the Painting Department.
2. Compute the total overhead cost applied to Job 205.
3. What would be the total cost recorded for Job 205? If the job contained 50 units, what would be the unit product cost?
4. At the end of the year, the records of High Desert Potteryworks revealed the following *actual* cost and operating data for all jobs worked on during the year:

	Department	
	Molding	Painting
Direct labour-hours	10,000	62,000
Machine-hours	65,000	9,000
Direct materials cost	\$430,000	\$680,000
Direct labour cost	\$108,000	\$436,000
Manufacturing overhead cost	\$570,000	\$750,000

What was the amount of under- or overapplied overhead in each department at the end of the year?

PROBLEM 3–24 T-Account Analysis of Cost Flows [LO3, LO6, LO8]

Selected ledger accounts of Moore Company are given below for the just completed year:

Raw Materials				Manufacturing Overhead			
		Credits	?	Debits	230,000	Credits	?
Bal. 1/1	15,000						
Debits	120,000						
<hr/>							
Bal. 12/31	25,000						

Work in Process				Factory Wages Payable			
Bal. 1/1	20,000	Credits	470,000	Debits	185,000	Bal. 1/1	9,000
Direct materials	90,000					Credits	180,000
Direct labour	150,000					Bal. 12/31	4,000
Overhead	240,000						
-----				-----			
Bal. 12/31	?						

Finished Goods				Cost of Goods Sold			
Bal. 1/1	40,000	Credits	?	Debits	?		
Debits	?						
-----				-----			
Bal. 12/31	60,000						

Required:

1. What was the cost of raw materials put into production during the year?
2. How much of the materials in (1) above consisted of indirect materials?
3. How much of the factory labour cost for the year consisted of indirect labour?
4. What was the cost of goods manufactured for the year?
5. What was the cost of goods sold for the year (before considering under- or overapplied overhead)?
6. If overhead is applied to production on the basis of direct labour cost, what rate was in effect during the year?
7. Was manufacturing overhead under- or overapplied? By how much?
8. Compute the ending balance in the Work in Process inventory account. Assume that this balance consists entirely of goods started during the year. If \$8,000 of this balance is direct labour cost, how much of it is direct materials cost? Manufacturing overhead cost?

PROBLEM 3–25 Journal Entries; T-Accounts; Disposition of Underapplied or Overapplied Overhead [LO3, LO4, LO5, LO7, LO8]

Film Specialties, Inc., operates a small production studio in which advertising films are made for TV and other uses. The company uses a job-order costing system to accumulate costs for each film produced. The company's trial balance as of May 1, the start of its fiscal year, is given as follows:

Cash	\$ 60,000	
Accounts Receivable	210,000	
Materials and Supplies	130,000	
Films in Process	75,000	
Finished Films	860,000	
Prepaid Insurance	90,000	
Studio and Equipment	5,200,000	
Accumulated Depreciation		\$1,990,000
Accounts Payable		700,000
Salaries and Wages Payable		35,000
Capital Stock		2,500,000
Retained Earnings		1,400,000
Total	<u>\$6,625,000</u>	<u>\$6,625,000</u>

Film Specialties, Inc., uses a Production Overhead account to record all transactions relating to overhead costs and applies overhead costs to jobs on the basis of camera-hours. For the current year, the company estimated that it would incur \$1,350,000 in production overhead costs, and film 15,000 camera-hours. During the year, the following transactions were completed:

- a. Materials and supplies purchased on account, \$690,000.
- b. Materials and supplies issued from the storeroom for use in production of various films, \$700,000 (80% direct to the films and 20% indirect).
- c. Utility costs incurred in the production studio, \$90,000.

d. Costs for employee salaries and wages were incurred as follows:

Actors, directors, and camera crew	\$1,300,000
Indirect labour costs of support workers	\$230,000
Marketing and administrative salaries	\$650,000

- e. Advertising costs incurred, \$800,000.
- f. Prepaid insurance expired during the year, \$70,000. Of this amount, \$60,000 related to the operation of the production studio, and the remaining \$10,000 related to the company’s marketing and administrative activities.
- g. Depreciation recorded for the year, \$650,000 (80% represented depreciation of the production studio, cameras, and other production equipment; the remaining 20% represented depreciation of facilities and equipment used in marketing and administrative activities).
- h. Rental costs incurred on various facilities and equipment used in production of films, \$360,000; and rental costs incurred on equipment used in marketing and administrative activities, \$40,000.
- i. Production overhead was applied to jobs filmed during the year. The company recorded 16,500 camera-hours.
- j. Films that cost \$3,400,000 to produce according to their job cost sheets were completed during the year. The films were transferred to the finished films storeroom to await delivery to customers.
- k. Sales of films for the year (all on account) totalled \$6,000,000. The total cost to produce these films was \$4,000,000 according to their job cost sheets.
- l. Collections on account from customers during the year, \$5,400,000.
- m. Cash payments made during the year; to creditors on account, \$2,500,000; and to employees for salaries and wages, \$2,200,000.

Required:

1. Prepare journal entries to record the year’s transactions.
2. Prepare a T-account for each account in the company’s trial balance and enter the opening balances given above. Post your journal entries to the T-accounts. Prepare new T-accounts as needed. Compute the ending balance in each account.
3. Is production overhead underapplied or overapplied for the year? Prepare the necessary journal entry to close the balance in Production Overhead to Cost of Films Sold.
4. Prepare an income statement for the year. (Do not prepare a schedule of cost of goods manufactured; all of the information needed for the income statement is available in the T-accounts.)

PROBLEM 3–26 Predetermined Overhead Rate; Disposition of Under- or Overapplied Overhead [LO3, LO8]

Bieler & Cie of Altdorf, Switzerland, makes furniture using the latest automated technology. The company uses a job-order costing system and applies manufacturing overhead cost to products on the basis of machine-hours. The following estimates were used in preparing the predetermined overhead rate at the beginning of the year:

Machine-hours	75,000
Manufacturing overhead cost	Sfr900,000

The currency in Switzerland is the Swiss franc, which is denoted by Sfr.

During the year, a glut of furniture on the market resulted in cutting back production and a buildup of furniture in the company’s warehouse. The company’s cost records revealed the following actual cost and operating data for the year:

Machine-hours	60,000
Manufacturing overhead cost	Sfr850,000
Inventories at year-end:	
Raw materials	Sfr30,000
Work in process (includes overhead applied of 36,000)	Sfr100,000
Finished goods (includes overhead applied of 180,000)	Sfr500,000
Cost of goods sold (includes overhead applied of 504,000)	Sfr1,400,000

Required:

1. Compute the company's predetermined overhead rate.
2. Compute the under- or overapplied overhead.
3. Assume that the company closes any under- or overapplied overhead directly to Cost of Goods Sold. Prepare the appropriate journal entry.
4. Assume that the company allocates any under- or overapplied overhead to Work in Process, Finished Goods, and Cost of Goods Sold on the basis of the amount of overhead applied that remains in each account at the end of the year. Prepare the journal entry to show the allocation for the year.
5. How much higher or lower will net operating income be if the under- or overapplied overhead is allocated rather than closed directly to Cost of Goods Sold?

PROBLEM 3–27 Schedule of Cost of Goods Manufactured; Overhead Analysis [LO3, LO5, LO6, LO7]



Gitano Products operates a job-order costing system and applies overhead cost to jobs on the basis of direct materials *used in production* (not on the basis of raw materials purchased). In computing a predetermined overhead rate at the beginning of the year, the company's estimates were: manufacturing overhead cost, \$800,000; and direct materials to be used in production, \$500,000. The company has provided the following data in the form of an Excel worksheet:

	Beginning	Ending
Raw Materials	\$20,000	\$80,000
Work in Process	\$150,000	\$70,000
Finished Goods	\$200,000	\$400,000
The following actual costs were incurred during the year		
Purchase of raw materials (all direct)		\$530,000
Direct labour cost		\$90,000
Manufacturing overhead costs		
Indirect labour		\$170,000
Property taxes		\$48,000
Depreciation of equipment		\$260,000
Maintenance		\$95,000
Insurance		\$7,000
Rent, building		\$180,000

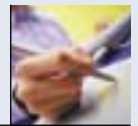
Required:

1. a. Compute the predetermined overhead rate for the year.
b. Compute the amount of under- or overapplied overhead for the year.
2. Prepare a schedule of cost of goods manufactured for the year.
3. Compute the Cost of Goods Sold for the year. (Do not include any under- or overapplied overhead in your Cost of Goods Sold figure.) What options are available for disposing of under- or overapplied overhead?
4. Job 215 was started and completed during the year. What price would have been charged to the customer if the job required \$8,500 in direct materials and \$2,700 in direct labour cost and the company priced its jobs at 25% above the job's cost according to the accounting system?
5. Direct materials made up \$24,000 of the \$70,000 ending Work in Process inventory balance. Supply the information missing below:

Direct materials	\$24,000
Direct labour	?
Manufacturing overhead	?
Work in process inventory	<u>\$70,000</u>

PROBLEM 3–28 (Appendix 3A) Predetermined Overhead Rate and Capacity [LO3, LO5, LO8, LO9]

Platinum Tracks, Inc., is a small audio recording studio located in Alberta. The company handles work for advertising agencies—primarily for radio ads—and has a few singers and bands as clients. Platinum Tracks handles all aspects of recording from editing to making a digital master from



which CDs can be copied. The competition in the audio recording industry in Alberta has always been tough, but it has been getting even tougher over the last several years. The studio has been losing customers to newer studios that are equipped with more up-to-date equipment and that are able to offer very attractive prices and excellent service. Summary data concerning the last two years of operations follow:

	2005	2004
Estimated hours of studio service	800	1,000
Estimated studio overhead cost	\$160,000	\$160,000
Actual hours of studio service provided	500	750
Actual studio overhead cost incurred	\$160,000	\$160,000
Hours of studio service at capacity	1,600	1,600

The company applies studio overhead to recording jobs on the basis of the hours of studio service provided. For example, 40 hours of studio time were required to record, edit, and master the *Verde Baja* music CD for a local Latino band. All of the studio overhead is fixed, and the actual overhead cost incurred was exactly as estimated at the beginning of the year in both 2004 and 2005.

Required:

1. Platinum Tracks computes its predetermined overhead rate at the beginning of each year based on the estimated studio overhead and the estimated hours of studio service for the year. How much overhead would have been applied to the *Verde Baja* job if it had been done in 2004? In 2005? By how much would overhead have been under- or overapplied in 2004? In 2005?
2. The president of Platinum Tracks has heard that some companies in the industry have changed to a system of computing the predetermined overhead rate at the beginning of each year based on the estimated studio overhead for the year and the hours of studio service that could be provided at capacity. He would like to know what effect this method would have on job costs. How much overhead would have been applied using this method to the *Verde Baja* job if it had been done in 2004? In 2005? By how much would overhead have been under- or overapplied in 2004 using this method? In 2005?
3. How would you interpret the under- or overapplied overhead that results from using studio hours at capacity to compute the predetermined overhead rate?
4. What fundamental business problem is Platinum Tracks facing? Which method of computing the predetermined overhead rate is likely to be more helpful in facing this problem? Explain.



PROBLEM 3–29 Multiple Departments; Overhead Rates; Under- or Overapplied Overhead [LO3, LO5, LO8]

Hobart, Evans, and Nix is a small law firm that contains 10 partners and 12 support persons. The firm employs a job-order costing system to accumulate costs chargeable to each client, and it is organized into two departments—the Research and Documents Department and the Litigation Department. The firm uses predetermined overhead rates to charge the costs of these departments to its clients. At the beginning of the year, the firm’s management made the following estimates for the year:

	Department	
	Research and Documents	Litigation
Research-hours	24,000	—
Direct lawyer-hours	9,000	18,000
Legal forms and supplies	\$16,000	\$5,000
Direct lawyer cost	\$450,000	\$900,000
Departmental overhead cost	\$840,000	\$360,000

The predetermined overhead rate in the Research and Documents Department is based on research-hours, and the rate in the Litigation Department is based on direct lawyer cost.

The costs charged to each client are made up of three elements: legal forms and supplies used, direct lawyer costs incurred, and an applied amount of overhead from each department in which work is performed on the case.

Case 418-3 was initiated on February 23 and completed on May 16. During this period, the following costs and time were recorded on the case:

	Department	
	Research and Documents	Litigation
Research-hours	26	—
Direct lawyer-hours	7	114
Legal forms and supplies	\$80	\$40
Direct lawyer cost	\$350	\$5,700

Required:

1. Compute the predetermined overhead rate used during the year in the Research and Documents Department. Compute the rate used in the Litigation Department.
2. Using the rates you computed in (1) above, compute the total overhead cost applied to Case 418-3.
3. What would be the total cost charged to Case 418-3? Show computations by department and in total for the case.
4. At the end of the year, the firm’s records revealed the following actual cost and operating data for all cases handled during the year:

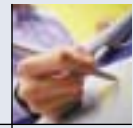
	Department	
	Research and Documents	Litigation
Research-hours	26,000	—
Direct lawyer-hours	8,000	15,000
Legal forms and supplies	\$19,000	\$6,000
Direct lawyer cost	\$400,000	\$750,000
Departmental overhead cost	\$870,000	\$315,000

Determine the amount of under- or overapplied overhead cost in each department for the year.

PROBLEM 3–30 Plantwide versus Departmental Overhead Rates; Under- or Overapplied Overhead [LO3, LO5, LO8]

“Blast it!” said David Wilson, president of Teledex Company. “We’ve just lost the bid on the Koopers job by \$2,000. It seems we’re either too high to get the job or too low to make any money on half the jobs we bid.”

Teledex Company manufactures products to customers’ specifications and operates a job-order costing system. Manufacturing overhead cost is applied to jobs on the basis of direct labour cost. The following estimates were made at the beginning of the year:



	Department			Total Plant
	Fabricating	Machining	Assembly	
Direct labour	\$200,000	\$100,000	\$300,000	\$600,000
Manufacturing overhead	\$350,000	\$400,000	\$90,000	\$840,000

Jobs require varying amounts of work in the three departments. The Koopers job, for example, would have required manufacturing costs in the three departments as follows:

	Department			Total Plant
	Fabricating	Machining	Assembly	
Direct materials	\$3,000	\$200	\$1,400	\$4,600
Direct labour	\$2,800	\$500	\$6,200	\$9,500
Manufacturing overhead	?	?	?	?

The company uses a plantwide overhead rate to apply manufacturing overhead cost to jobs.

Required:

1. Assuming use of a plantwide overhead rate:
 - a. Compute the rate for the current year.
 - b. Determine the amount of manufacturing overhead cost that would have been applied to the Koopers job.
2. Suppose that instead of using a plantwide overhead rate, the company had used a separate pre-determined overhead rate in each department. Under these conditions:
 - a. Compute the rate for each department for the current year.
 - b. Determine the amount of manufacturing overhead cost that would have been applied to the Koopers job.
3. Explain the difference between the manufacturing overhead that would have been applied to the Koopers job using the plantwide rate in question 1 (b) above and using the departmental rates in question 2 (b).
4. Assume that it is customary in the industry to bid jobs at 150% of total manufacturing cost (direct materials, direct labour, and applied overhead). What was the company’s bid price on the Koopers job? What would the bid price have been if departmental overhead rates had been used to apply overhead cost?
5. At the end of the year, the company assembled the following *actual* cost data relating to all jobs worked on during the year.

	Department			Total Plant
	Fabricating	Machining	Assembly	
Direct materials	\$190,000	\$16,000	\$114,000	\$320,000
Direct labour	\$210,000	\$108,000	\$262,000	\$580,000
Manufacturing overhead	\$360,000	\$420,000	\$84,000	\$864,000

Compute the under- or overapplied overhead for the year (a) assuming that a plantwide overhead rate is used, and (b) assuming that departmental overhead rates are used.



PROBLEM 3–31 Journal Entries; T-Accounts; Comprehensive Problem; Financial Statements; [LO3, LO4, LO5, LO6, LO7, LO8]

Froya Fabrikker A/S of Bergen, Norway, is a small company that manufactures specialty heavy equipment for use in North Sea oil fields. (The Norwegian currency is the krone, which is denoted by Nkr.) The company uses a job-order costing system and applies manufacturing overhead cost to jobs on the basis of direct labour-hours. At the beginning of the year, the following estimates were made for the purpose of computing the predetermined overhead rate: manufacturing overhead cost, Nkr360,000; and direct labour-hours, 900.

The following transactions took place during the year (all purchases and services were acquired on account):

- a. Raw materials were purchased for use in production, Nkr200,000.
- b. Raw materials were requisitioned for use in production (all direct materials), Nkr185,000.
- c. Utility bills were incurred, Nkr70,000 (90% related to factory operations, and the remainder related to selling and administrative activities).
- d. Salary and wage costs were incurred:

Direct labour (975 hours)	Nkr230,000
Indirect labour	Nkr90,000
Selling and administrative salaries	Nkr110,000

- e. Maintenance costs were incurred in the factory, Nkr54,000.
- f. Advertising costs were incurred, Nkr136,000.
- g. Depreciation was recorded for the year, Nkr95,000 (80% related to factory equipment, and the remainder related to selling and administrative equipment).
- h. Rental cost incurred on buildings, Nkr120,000 (85% related to factory operations, and the remainder related to selling and administrative facilities).
- i. Manufacturing overhead cost was applied to jobs, Nkr ____? ____.
- j. Cost of goods manufactured for the year, Nkr770,000.

- k. Sales for the year (all on account) totalled Nkr1,200,000. These goods cost Nkr800,000 to manufacture according to their job cost sheets.

The balances in the inventory accounts at the beginning of the year were:

Raw Materials	Nkr30,000
Work in Process	Nkr21,000
Finished Goods	Nkr60,000

Required:

1. Prepare journal entries to record the preceding data.
2. Post your entries to T-accounts. (Don't forget to enter the beginning inventory balances above.) Determine the ending balances in the inventory accounts and in the Manufacturing Overhead account.
3. Prepare a schedule of cost of goods manufactured.
4. Prepare a journal entry to close any balance in the Manufacturing Overhead account to Cost of Goods Sold. Prepare a schedule of cost of goods sold.
5. Prepare an income statement for the year.
6. Job 412 was one of the many jobs started and completed during the year. The job required Nkr8,000 in direct materials and 39 hours of direct labour time at a total direct labour cost of Nkr9,200. The job contained only four units. If the company bills at a price 60% above the unit product cost on the job cost sheet, what price per unit would have been charged to the customer?

PROBLEM 3-32 Comprehensive Problem: T-Accounts, Job-Order Cost Flows; Financial Statements [LO3, LO5, LO6, LO8]

Chenko Products, Inc., manufactures goods to customers' orders and uses a job-order costing system. A beginning-of-the-year trial balance for the company is given below:

Cash	\$ 35,000	
Accounts Receivable	127,000	
Raw Materials	10,000	
Work in Process	44,000	
Finished Goods	75,000	
Prepaid Insurance	9,000	
Plant and Equipment	400,000	
Accumulated Depreciation		\$110,000
Accounts Payable		86,000
Salaries and Wages Payable		9,000
Capital Stock		375,000
Retained Earnings		120,000
Total	<u>\$700,000</u>	<u>\$700,000</u>

The company applies manufacturing overhead cost to jobs on the basis of direct materials cost. The following estimates were made at the beginning of the year for purposes of computing a pre-determined overhead rate: manufacturing overhead cost, \$510,000; and direct materials cost, \$340,000. Summarized transactions of the company for the year are given below:

- a. Raw materials purchased on account, \$400,000.
- b. Raw materials requisitioned for use in production, \$370,000 (\$320,000 direct materials and \$50,000 indirect materials).
- c. Salary and wage costs were incurred as follows:

Direct labour	\$76,000
Indirect labour	\$130,000
Selling and administrative salaries	\$110,000

- d. Maintenance costs incurred in the factory, \$81,000.
- e. Travel costs incurred by salespeople, \$43,000.
- f. Prepaid insurance on the factory expired during the year, \$7,000.
- g. Utility costs incurred, \$70,000 (90% related to factory operations, and 10% related to selling and administrative activities).

- h. Property taxes incurred on the factory building, \$9,000.
- i. Advertising costs incurred, \$200,000.
- j. Rental cost incurred on special factory equipment, \$120,000.
- k. Depreciation recorded for the year, \$50,000 (80% related to factory assets, and 20% related to selling and administrative assets).
- l. Manufacturing overhead cost applied to jobs, \$? .
- m. Cost of goods manufactured for the year, \$890,000.
- n. Sales for the year totalled \$1,400,000 (all on account); the cost of goods sold totalled \$930,000.
- o. Cash collections from customers during the year totalled \$1,350,000.
- p. Cash payments during the year: to employees, \$300,000; on accounts payable, \$970,000.

Required:

1. Enter the company's transactions directly into T-accounts. (Don't forget to enter the beginning balances into the T-accounts.) Key your entries to the letters (a) through (p) above. Create new T-accounts as needed. Find the ending balance in each account.
2. Prepare a schedule of cost of goods manufactured.
3. Prepare a journal entry to close any balance in the Manufacturing Overhead account to Cost of Goods Sold. Prepare a schedule of cost of goods sold.
4. Prepare an income statement for the year.
5. Job 412 was one of the many jobs started and completed during the year. The job required \$8,000 in direct materials and \$1,600 in direct labour cost. If the job contained 400 units and the company billed the job at 175% of the unit product cost on the job cost sheet, what price per unit would have been charged to the customer?

CASES

**CASE 3–33 Critical Thinking; Interpretation of Manufacturing Overhead Rates [LO3, LO5]**

Kelvin Aerospace, Inc., manufactures parts such as rudder hinges for the aerospace industry. The company uses a job-order costing system with a plantwide predetermined overhead rate based on direct labour-hours. On December 16, 2005, the company's controller made a preliminary estimate of the predetermined overhead rate for the year 2006. The new rate was based on the estimated total manufacturing overhead cost of \$3,402,000 and the estimated 63,000 total direct labour-hours for 2006:

$$\begin{aligned} \text{Predetermined overhead rate} &= \frac{\$3,402,000}{63,000 \text{ hours}} \\ &= \$54 \text{ per direct labour-hour} \end{aligned}$$

This new predetermined overhead rate was communicated to top managers in a meeting on December 19. The rate did not cause any comment because it was within a few pennies of the overhead rate that had been used during 2005. One of the subjects discussed at the meeting was a proposal by the production manager to purchase an automated milling machine built by Sunghi Industries. The president of Kelvin Aerospace, Harry Arcany, agreed to meet with the sales representative from Sunghi Industries to discuss the proposal.

On the day following the meeting, Mr. Arcany met with Jasmine Chang, Sunghi Industries' sales representative. The following discussion took place:

Arcany: Wally, our production manager, asked me to meet with you since he is interested in installing an automated milling machine. Frankly, I'm skeptical. You're going to have to show me this isn't just another expensive toy for Wally's people to play with.

Chang: This is a great machine with direct bottom-line benefits. The automated milling machine has three major advantages. First, it is much faster than the manual methods you are using. It can process about twice as many parts per hour as your present milling machines. Second, it is much more flexible. There are some up-front programming costs, but once those have been incurred, almost no setup is required to run a standard operation. You just punch in the code for the standard operation, load the machine's hopper with raw material, and the machine does the rest.

Arcany: What about cost? Having twice the capacity in the milling machine area won't do us much good. That centre is idle much of the time anyway.

Chang: I was getting there. The third advantage of the automated milling machine is lower cost. Wally and I looked over your present operations, and we estimated that the automated equipment would eliminate the need for about 6,000 direct labour-hours a year. What is your direct labour cost per hour?

Arcany: The wage rate in the milling area averages about \$32 per hour. Employee benefits raise that figure to about \$41 per hour.

Chang: Don't forget your overhead.

Arcany: Next year the overhead rate will be \$54 per hour.

Chang: So including employee benefits and overhead, the cost per direct labour-hour is about \$95.

Arcany: That's right.

Chang: Since you can save 6,000 direct labour-hours per year, the cost savings would amount to about \$570,000 a year. And our 60-month lease plan would require payments of only \$348,000 per year.

Arcany: That sounds like a no-brainer. When can you install the equipment?

Shortly after this meeting, Mr. Arcany informed the company's controller of the decision to lease the new equipment, which would be installed over the Christmas vacation period. The controller realized that this decision would require a recomputation of the predetermined overhead rate for the year 2006 since the decision would affect both the manufacturing overhead and the direct labour-hours for the year. After talking with both the production manager and the sales representative from Sunghi Industries, the controller discovered that in addition to the annual lease cost of \$348,000, the new machine would also require a skilled technician/programmer who would have to be hired at a cost of \$50,000 per year to maintain and program the equipment. Both of these costs would be included in factory overhead. There would be no other changes in total manufacturing overhead cost, which is almost entirely fixed. The controller assumed that the new machine would result in a reduction of 6,000 direct labour-hours for the year from the levels that had initially been planned.

When the revised predetermined overhead rate for the year 2006 was circulated among the company's top managers, there was considerable dismay.

Required:

1. Recompute the predetermined rate assuming that the new machine will be installed. Explain why the new predetermined overhead rate is higher (or lower) than the rate that was originally estimated for the year 2006.
2. What effect (if any) would this new rate have on the cost of jobs that do not use the new automated milling machine?
3. Why would managers be concerned about the new overhead rate?
4. After seeing the new predetermined overhead rate, the production manager admitted that he probably wouldn't be able to eliminate all of the 6,000 direct labour-hours. He had been hoping to accomplish the reduction by not replacing workers who retire or quit, but that had not been possible. As a result, the real labour savings would be only about 2,000 hours—one worker. Given this additional information, evaluate the original decision to acquire the automated milling machine from Sunghi Industries.

CASE 3-34 (Appendix 3A) Ethics; Predetermined Overhead Rate and Capacity [LO5, LO8, LO9]

Pat Miranda, the new controller of Vault Hard Drives, Inc., has just returned from a seminar on the choice of the activity level in the predetermined overhead rate. Even though the subject did not sound exciting at first, she found that there were some important ideas presented that should get a hearing at her company. After returning from the seminar, she arranged a meeting with the production manager, J. Stevens, and the assistant production manager, Marvin Washington.

Pat: I ran across an idea that I wanted to check out with both of you. It's about the way we compute predetermined overhead rates.

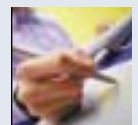
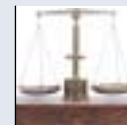
J.: We're all ears.

Pat: We compute the predetermined overhead rate by dividing the estimated total factory overhead for the coming year by the estimated total units produced for the coming year.

Marvin: We've been doing that as long as I've been with the company.

J.: And it has been done that way at every other company I've worked at, except at most places they divide by direct labour-hours.

Pat: We use units because it is simpler and we basically make one product with minor variations. But, there's another way to do it. Instead of dividing the estimated total factory overhead by the estimated total units produced for the coming year, we could divide by the total units produced at capacity.



Marvin: Oh, the Sales Department will love that. It will drop the costs on all of our products. They'll go wild over there cutting prices.

Pat: That is a worry, but I wanted to talk to both of you first before going over to Sales.

J.: Aren't you always going to have a lot of underapplied overhead?

Pat: That's correct, but let me show you how we would handle it. Here's an example based on our budget for next year.

Budgeted (estimated) production	160,000 units
Budgeted sales	160,000 units
Capacity	200,000 units
Selling price	\$60 per unit
Variable manufacturing cost	\$15 per unit
Total manufacturing overhead cost (all fixed)	\$4,000,000
Administrative and selling expenses (all fixed)	\$2,700,000
Beginning inventories	\$0

Traditional Approach to Computation of the Predetermined Overhead Rate

$$\frac{\text{Estimated total manufacturing overhead cost, \$4,000,000}}{\text{Estimated total units produced, 160,000}} = \$25 \text{ per unit}$$

Revenue (160,000 units × \$60 per unit)		\$9,600,000
Cost of goods sold:		
Variable manufacturing (160,000 units × \$15 per unit)	\$2,400,000	
Manufacturing overhead applied		
(160,000 units × \$25 per unit)	4,000,000	6,400,000
Gross margin		3,200,000
Administrative and selling expenses		2,700,000
Net operating income		<u>\$ 500,000</u>

New Approach to Computation of the Predetermined Overhead Rate Using Capacity in the Denominator

$$\frac{\text{Estimated total manufacturing overhead cost, \$4,000,000}}{\text{Total units at capacity, 200,000}} = \$20 \text{ per unit}$$

Revenue (160,000 units × \$60 per unit)		\$9,600,000
Cost of goods sold:		
Variable manufacturing (160,000 units × \$15 per unit)	\$2,400,000	
Manufacturing overhead applied		
(160,000 units × \$20 per unit)	3,200,000	5,600,000
Gross margin		4,000,000
Cost of unused capacity [(200,000 units – 160,000 units) × \$20 per unit]		800,000
Administrative and selling expenses		2,700,000
Net operating income		<u>\$ 500,000</u>

J.: Whoa!! I don't think I like the looks of that "Cost of unused capacity." If that thing shows up on the income statement, someone from headquarters is likely to come down here looking for some people to lay off.

Marvin: I'm worried about something else too. What happens when sales are not up to expectations? Can we pull the "hat trick"?

Pat: I'm sorry, I don't understand.

J.: Marvin's talking about something that happens fairly regularly. When sales are down and profits look like they are going to be lower than the president told the owners they were going to be, the president comes down here and asks us to deliver some more profits.

Marvin: And we pull them out of our hat.

J.: Yeah, we just increase production until we get the profits we want.

Pat: I still don't understand. You mean you increase sales?

J.: Nope, we increase production. We're the production managers, not the sales managers.

Pat: I get it. Since you have produced more, the sales force has more units it can sell.

J.: Nope, the marketing people don't do a thing. We just build inventories and that does the trick.

Required:

In all of the questions below, assume that the predetermined overhead rate under the traditional method is \$25 per unit, and under the new method it is \$20 per unit. Also assume that under the traditional method any under- or overapplied overhead is taken directly to the income statement as an adjustment to Cost of Goods Sold.

1. Suppose actual production is 160,000 units. Compute the net operating incomes that would be realized under the traditional and new methods if actual sales are 150,000 units and everything else turns out as expected.
2. How many units would have to be produced under each of the methods in order to realize the budgeted net operating income of \$500,000 if actual sales are 150,000 units and everything else turns out as expected?
3. What effect does the new method based on capacity have on the volatility of net operating income?
4. Will the "hat trick" be easier or harder to perform if the new method based on capacity is used?
5. Do you think the "hat trick" is ethical?

CASE 3–35 Ethics and the Manager [LO3, LO5, LO8]

Terri Ronsin had recently been transferred to the Home Security Systems Division of National Home Products. Shortly after taking over her new position as divisional controller, she was asked to develop the division's predetermined overhead rate for the upcoming year. The accuracy of the rate is of some importance, since it is used throughout the year and any overapplied or underapplied overhead is closed out to Cost of Goods Sold at the end of the year. National Home Products uses direct labour-hours in all of its divisions as the allocation base for manufacturing overhead.

To compute the predetermined overhead rate, Terri divided her estimate of the total manufacturing overhead for the coming year by the production manager's estimate of the total direct labour-hours for the coming year. She took her computations to the division's general manager for approval but was quite surprised when he suggested a modification in the base. Her conversation with the general manager of the Home Security Systems Division, Harry Irving, went like this:

Ronsin: Here are my calculations for next year's predetermined overhead rate. If you approve, we can enter the rate into the computer on January 1 and be up and running in the job-order costing system right away this year.

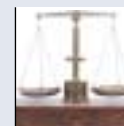
Irving: Thanks for coming up with the calculations so quickly, and they look just fine. There is, however, one slight modification I would like to see. Your estimate of the total direct labour-hours for the year is 440,000 hours. How about cutting that to about 420,000 hours?

Ronsin: I don't know if I can do that. The production manager says she will need about 440,000 direct labour-hours to meet the sales projections for the year. Besides, there are going to be over 430,000 direct labour-hours during the current year and sales are projected to be higher next year.

Irving: Teri, I know all of that. I would still like to reduce the direct labour-hours in the base to something like 420,000 hours. You probably don't know that I had an agreement with your predecessor as divisional controller to shave 5% or so off the estimated direct labour-hours every year. That way, we kept a reserve that usually resulted in a big boost to net operating income at the end of the fiscal year in December. We called it our Christmas bonus. Corporate headquarters always seemed as pleased as punch that we could pull off such a miracle at the end of the year. This system has worked well for many years, and I don't want to change it now.

Required:

1. Explain how shaving 5% off the estimated direct labour-hours in the base for the predetermined overhead rate usually results in a big boost in net operating income at the end of the fiscal year.
2. Should Terri Ronsin go along with the general manager's request to reduce the direct labour-hours in the predetermined overhead rate computation to 420,000 direct labour-hours?



GROUP AND INTERNET EXERCISES



GROUP EXERCISE 3–36 Talk with a Controller

Look in the yellow pages or contact your local chamber of commerce or local chapter of a professional accounting association to find the names of manufacturing companies in your area. Make an appointment to meet with the controller or chief financial officer of one of these companies.

Required:

Ask the following questions and write a brief report concerning what you found out.

1. Does the company use job-order costing, process costing, or some other method of determining product costs?
2. How is overhead assigned to products? What is the overhead rate? What is the basis of allocation? Is more than one overhead rate used?
3. Are product costs used in making any decisions? If so, what are those decisions and how are product costs used?
4. How are profits affected by changes in production volume? By changes in sales?
5. Has the company recently changed its cost system or is it considering changing its cost system? If so, why? What changes were made or what changes are being considered?

INTERNET EXERCISE 3–37

As you know, the World Wide Web is constantly evolving. Sites come and go, and change without notice. To enable periodic updating of site addresses, this problem has been posted to the textbook Web site (www.mcgrawhill.ca/college/garrison). After accessing the site, enter the Student Centre and select this chapter. Select and complete the Internet Exercise.