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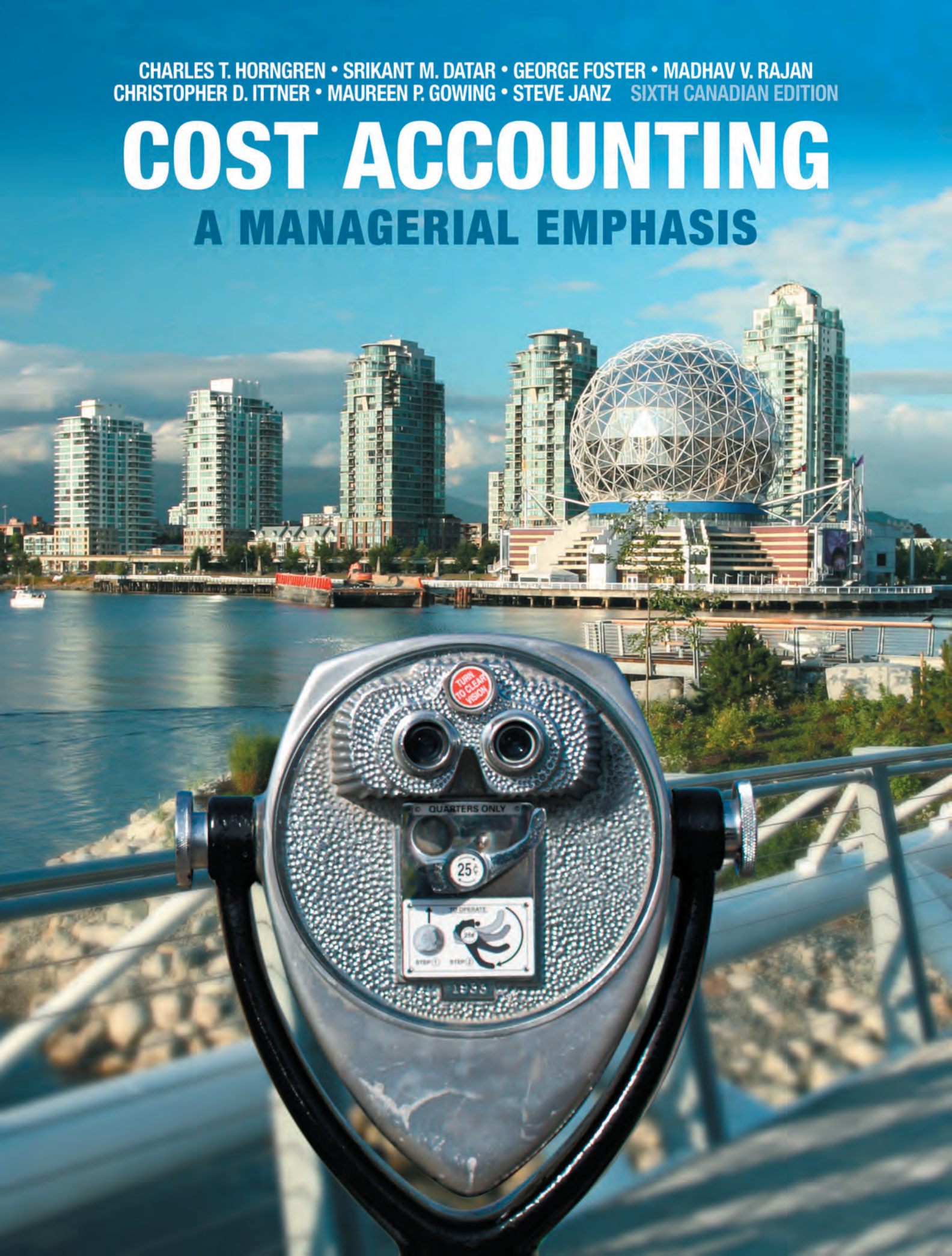
SIXTH CANADIAN EDITION

COST ACCOUNTING

A MANAGERIAL EMPHASIS



CHAPTER

Job Costing

4

BUSINESS MATTERS

What Does It Cost to Do the Job?

Each summer about 7,500 forest fires burn an average of 250,000 square kilometres of Canadian wilderness. A ferocious force of nature, wildfires cost Canadian taxpayers approximately $417 million per year to suppress. Fires cause evacuations of entire cities, destroy property, create economic hardship, and kill wildlife and people. In May 2011, almost half of Slave Lake in northern Alberta was destroyed by wildfire. But forest fires also renew the forests. In its aftermath, the minerals in the soil are revitalized and the sun penetrates to the forest floor.

The cost to suppress a forest fire depends on how accessible the fire is. Unfortunately, the most inaccessible wildfires are the most destructive and expensive to suppress. These fires are fought primarily using aircraft and fire retardant chemicals. The firefighters are delivered to the site by parachuting in (smoke jumpers) or rapelling in by rope from helicopters. On average, the cost to suppress a Canadian wildfire is approximately $60,000 per fire. Provincial governments use careful job-costing procedures to refine and improve their cost estimates for fire suppression. Governments need a reliable job-costing system so they can account to the taxpayers when asked how money was spent.

LEARNING OUTCOMES

After studying this chapter, you should be able to

1. Identify and explain the elements of an effective job-costing system.
2. Apply the decision framework in a seven-step method to assign total actual costs to a distinct service.
3. Apply the decision framework in a seven-step method to assign total actual costs to a distinct product.
4. Distinguish among three methods—actual, budgeted, and normal—to calculate job-cost allocation rates and assign indirect costs to a distinct job.
5. Analyze the flow of costs from direct and indirect cost pools to inventory accounts, including adjustments for over- and underallocated costs.

BUILDING-BLOCK CONCEPTS OF COSTING SYSTEMS

1 Identify and explain the elements of an effective job-costing system.

All companies need to have an effective costing system. Management teams use information from their MIS to cost various types of cost objects, especially those that will generate revenue plus some reasonable profit when they are sold. We will use the generic term *jobs* to represent a cost object that will be sold. Job costing gives management teams the added ability to predict or budget for future improved profitability by planning to accept the most profitable types of jobs. For manufacturers, there are also external benefits. When reporting to external parties, GAAP compliance requires that indirect support costs of production (MOH) be included in cost of goods sold.

When companies produce distinct types of customized jobs, the job-costing system distinguishes costs of unequally shared resources used to customize each distinct type of job. This also allows companies to select the most profitable types of customized jobs. Job costing exploits the relationship between the quantity of inputs used and the change in the costs of those inputs. The team must decide on the best way to measure the unequal benefits provided to each job. What makes one job distinct from another is often the unequal quantities of shared inputs used. The difference in quantities used will be reflected in the assignment of different costs among different types of jobs.

To simplify the development of the costing system, we will assume the quality of inputs and the cost per unit is constant. Managers often combine cost information with non-cost information such as quantity of rework or volume of customer complaints. This helps ensure that key success factors won't be sacrificed in the long term for short-term profitability. This chapter focuses on assigning costs to a job that is either a tangible output (e.g., the BMW X5) or a less tangible outcome (e.g., suppressing a wildfire).

We assume that the actual cost of inputs and the quantities used have already been accumulated in the general ledger accounts of the company (MIS). We also assume that the finished jobs differ in the quantities of shared inputs (and accompanying costs) used to complete the job. If this were not true, a simple average cost of all jobs would be sufficient to set prices and budget for the future.

We also assume that the different quantity of inputs used is a good measure of different benefit or value added to the type of job. This is called a *proxy* or indirect measure of the benefit to a job. If the quantities of inputs used differ from one type of job to another, then it makes sense to make sure each type of job bears its fair share of indirect costs and that customers pay for this added value. The costs of shared inputs used by each type of job will be assigned according to the quantity of inputs used.

ASSIGNING DIRECT AND INDIRECT COSTS

An important management accounting task is to reclassify the job costs as direct or indirect manufacturing costs (MOH) and distinguish them from non-manufacturing costs.[1] Once this classification is done, then a job-costing system can be created. Direct costs can be traced to each job by the quantity of direct inputs used for each job. Three direct costs are direct materials (DM), direct labour-hours (DLH), and direct machine hours (DMH).

Indirect costs cannot be traced to one job because they are common costs incurred to support finishing all jobs. As you recall from Chapter 2 (p. 29), there are many indirect costs. In a traditional job-costing system, all of these are accumulated into one cost pool and an average **indirect cost allocation rate** is calculated. The indirect cost pool is then assigned to each type of job in a multi-stage process that is described in this chapter.

The key elements of a job-costing system are as follows:

- The distinct type of job is the cost object.
- Direct cost pools are accumulated separately from the indirect cost pool of the same distinct type of job.

[1]Assignment of non-manufacturing costs will be discussed in Chapter 14.

- Quantities of inputs (shared resources used) to complete the job generate all the cost pools, and these inputs are called *cost drivers* (also called a *cost allocation base*).
- The *cost driver rate* (also called *cost allocation rate*) is the result of dividing the indirect cost pool by the total quantity of shared inputs used (the cost driver) to complete the job.

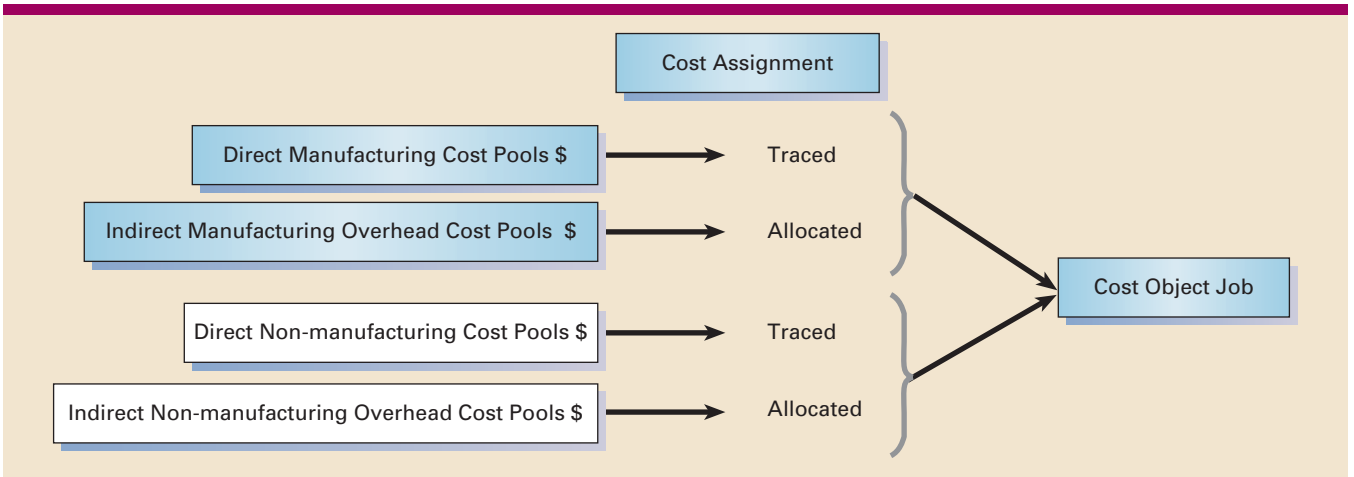
Direct costs of DM, DLH, and DMH can be readily identified against a job, either electronically or manually, by giving the job a code and entering the code each time direct inputs are used for that particular job. Documentation ensures the direct cost will be traced to one cost object, the finished job. Because we assumed the cost rate per unit of input is constant, as each unit of direct input is used to complete the job the direct costs will rise with the quantity used. As we learned in Chapter 2, this is the distinguishing feature of a variable cost. The accumulation of total variable DM costs for a job is called a DM **cost pool**. DLH and DMH cost pools are named similarly.

Examples of indirect costs include custodial, maintenance, and security costs, rework, and fringe benefits, all of which vary with the hours worked. Of course the cost rate to pay for janitorial labour will be different from that paid for maintenance labour. Both of these different costs are variable and often summed together with fringe benefit costs in the same indirect cost pool. Fixed costs such as insurance and property rental fees are also indirect and added to the same cost pool as the variable indirect costs. The indirect cost pool is a mix of fixed and variable costs from many sources.

The problem is how to divide up the indirect cost pool among the jobs, knowing each job uses inputs common to them all in different quantities. This task is called **cost allocation**, and it is a method to estimate the cost of common inputs used in different quantities by different jobs. Recall from Chapter 2 that managers assign the direct cost pool by tracing, and the indirect cost pool by allocating the costs to each job. These relationships are illustrated in Exhibit 4-1.

To assign the single *indirect* cost pool to jobs, a link needs to be made that can methodically and consistently explain how a change in the use of one input can explain changes to the costs assigned to the job. The assumption is that the more of an input that is used, the higher the benefit or value added to the job will be. The input use is the reason why one job costs more or less than another. The link is called a **cost allocation base (cost driver)**. The selection of this input is difficult since an MIS usually records the quantity of direct inputs, not the indirect inputs. Many small businesses cannot afford to keep track of every quantity of every indirect input, nor would it make sense to spend the money required to do so. This is a proxy measure of benefit.

EXHIBIT 4-1
Generic Job-Costing System



For manufacturing jobs the management team has three choices for a cost allocation base: quantity of DM, DMLH, or DMH. The goal is to make sure that the economic fact of how much a job costs is captured in the choice of the cost allocation base. Managers assume that their choice of a direct input used in different quantities by different jobs is a good signal of the proportion of common indirect resources each distinct job consumes. For example, if job 1 consumes more DMH than job 2, then it will also consume more common resources. If true, then the costing system will represent the real cost of the job completion process faithfully. Using more machine hours means more of the maintenance and property insurance costs should be assigned to job 1. The recovery of all direct and indirect costs for job 1 means the customer will pay more for this job than for job 2.

Clearly, the use of DMH does not explain how the costs of direct materials should be assigned to each job because these depend on costs per unit of DM. But remember that job costing is a GAAP-compliant, inexpensive way to *estimate* differences in job costs and assign these costs in a reasonable way. One guideline to help managers make this choice is whether the conversion of inputs into finished goods is more machine or labour intensive. If it is more machine intensive, then DMH would be a better choice as a cost allocation base than DMLH, and vice versa for a job that is more labour intensive.

In this chapter we will specify the cost allocation base, but in reality this is a difficult management task. Interestingly, the measurement of a quantity of inputs can be either non-financial, such as hours of direct labour, or financial, such as total cost of direct labour used. There is nothing stopping managers from selecting more than one pair of indirect cost pools and cost allocation bases when it is appropriate to the business decision that must be made. The larger the number of indirect cost pools, the more refined the job-costing system will be (which is described further in Chapter 5).

The **cost allocation rate** is the result of dividing the indirect cost pool by the cost allocation base (see Exhibit 4-2). This is the simple average indirect cost per cost object. Even though the cost allocation base is a direct input quantity, the indirect cost allocation rate is never the same as any direct cost rate. The reason, of course, is that the indirect cost pool is the result of common use of the same support resources by all jobs. If the cost object is one customized BMW X5 and the cost allocation base is the total number of *direct* manufacturing labour hours (DMLH), then the indirect cost allocation rate is the *indirect* cost per DMLH. This is a cost per unit of benefit to the job.

The cost allocation rate and the quantity of DMLH per customized BMW X5 are used to *assign* the indirect cost per customized BMW X5. Multiplying the indirect cost allocation rate by the quantity of DMLH per customized BMW X5 equals the total indirect cost per customized BMW X5.

EXHIBIT 4-2
Calculating the Cost Allocation Rate

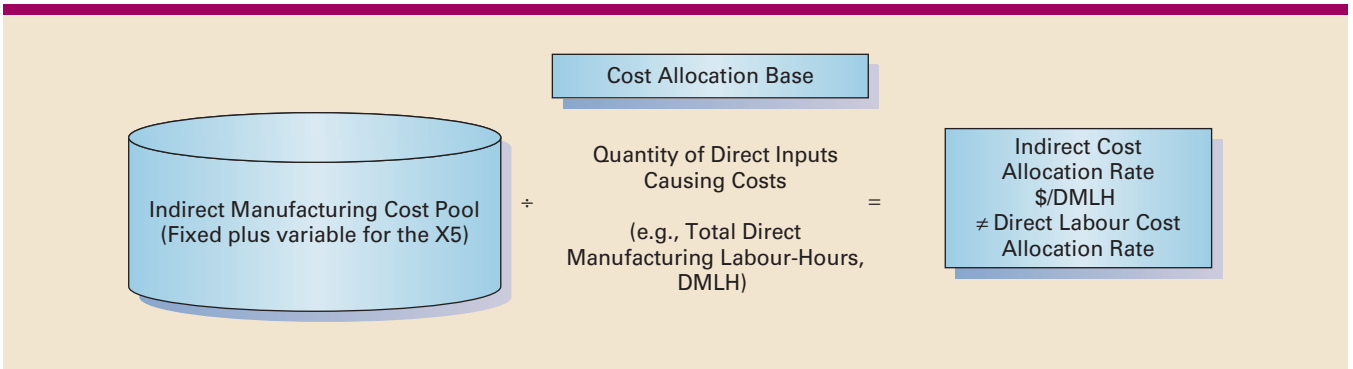
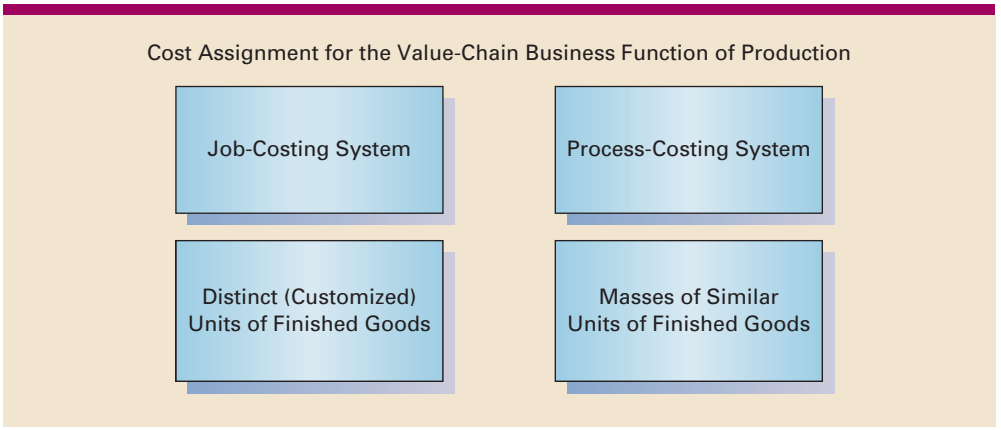


EXHIBIT 4-3
Cost Assignment Systems



JOB-COSTING AND PROCESS-COSTING SYSTEMS

Management accountants use two basic types of costing systems to assign costs to products or services (see Exhibit 4-3):

1. **Job-costing system.** In this system, the cost object is a distinct product or service called a **job**. For example, an advertising campaign produced by Cossette for Bombardier executive jets will be a service both unique and distinct from advertising campaigns for other clients. Job costing is also used to cost units of a distinct product, such as the costs incurred by Bombardier to customize an executive jet for a customer. Job-costing systems accumulate costs separately for each product or service.
2. **Process-costing system.**[2] In this system, the cost object is masses of identical units. For example, RBC Financial provides the same service to all its customers when processing ATM customer deposits, withdrawals, and bill payments. Customers of Maple Leaf all receive packages of the same processed meat. In each specified time period, process-costing systems use a cost allocation base called equivalent units to calculate an average prime cost and a separate average conversion or indirect cost rate. Averages are appropriate because each unit of finished goods consumes the same resources in the same quantities as all other units.

Companies have costing systems with elements of both job- and process-costing systems. Exhibit 4-4 shows a list of job-costing and process-costing examples in the service, merchandising, and manufacturing sectors. These two types of costing systems are best considered as opposite ends of a continuum; in between, one type of system can blur into the other to some degree. To provide information about the real costs of production in some time period, costing systems need to be tailored to the underlying production activities. For example, Kellogg Corporation uses job costing to calculate the total cost to manufacture each of its different and distinct types of products—such as frozen Eggos or boxes of Corn Flakes—but process costing to calculate the per-unit cost of producing each identical box of Corn Flakes. In this chapter, we focus on a job-costing system.

In this system, the cost object is at least one finished unit of a distinct product or service called a job. The finished product or service is customized such that its cost is distinct from the cost of other finished products or services. Customizing different jobs means using different quantities of inputs. For example, the cost of the legal service to defend Conrad Black of Hollinger in the United States differed from the cost of the legal service to defend Garth Drabinsky of Livent here in Canada.

[2]Process costing is discussed in detail in Chapter 17.

EXHIBIT 4-4

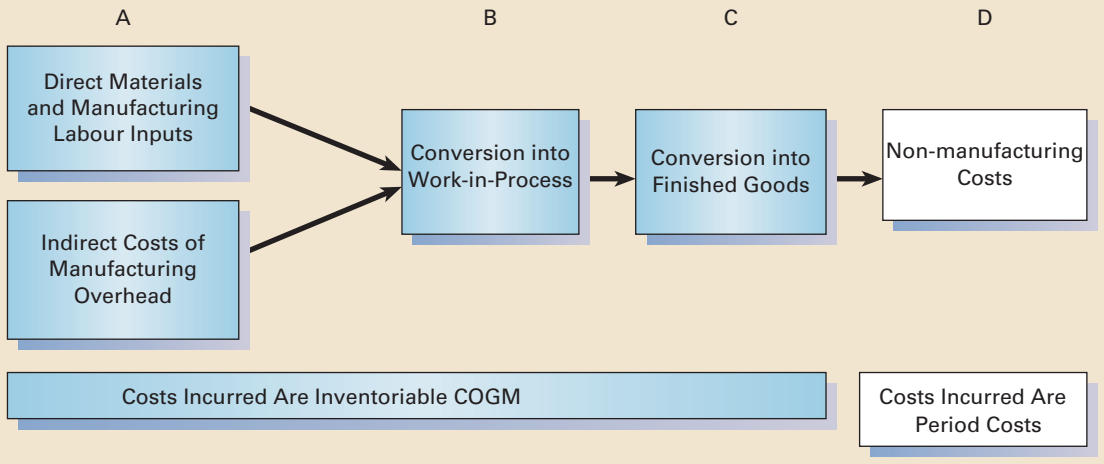
Examples of Job Costing and Process Costing in the Service, Merchandising, and Manufacturing Sectors

	Service Sector	Merchandising Sector	Manufacturing Sector
Job Costing Used	• Audit engagements done by Price Waterhouse Coopers • Consulting engagements done by McKinsey & Co. • Advertising-agency campaigns run by Cossette • Individual legal cases argued by Hale & Dorr • Computer-repair jobs done by Future Shop • Movies produced by Universal Studios	• Lululemon sending individual items by mail order • Special promotion of new products by Wal-Mart	• Assembly of individual executive jets at Boeing • Construction of bridges at Stantec Engineering
Process Costing Used	• Bank-cheque clearing at RBC • Postal delivery (standard items) by Canada Post	• Grain dealing by Arthur Daniel Midlands • Lumber dealing by Weyerhauser	• Oil refining by Canadian National Resources Limited • Beverage production by PepsiCo

A generic production function, shown in blue to match the value-chain assignment of production costs, is shown in Exhibit 4-5. The costs of DM and manufacturing overhead (MOH) are exclusive to the production function because they represent the direct and indirect costs of production. Rarely are 100% of direct materials converted in a specific time period, though, which is why both the work-in-process and finished goods inventory are included in blue to signify a production output. The cost of goods manufactured (COGM) includes direct materials and conversion. The other business functions in the value-chain are non-manufacturing costs and have no signifying colour. They are never included in COGM.

EXHIBIT 4-5

Generic Process Cost Allocation



ASSIGNING COSTS TO JOBS

In general, there are seven steps in assigning costs to jobs (we will revisit these seven steps later in this chapter to assign total actual costs to a distinct service and a distinct product). To simplify these steps, we will ignore the difficulties in the decisions about what the cost object will be, the number of indirect cost pools, and the identification of appropriate cost drivers used to calculate the cost allocation rate.

Step 1: Identify the Distinct Job That Is the Cost Object Examples of a job would be the construction of a machine to a customer's specification or the production of a custom kitchen. For professional services, the job could be the audit of RIM. **Source documents**, which are original records (such as a labour time card) that support journal entries in the accounting system, provide relevant information because they link the quantity of a resource consumed to a distinct job.

All costs are accumulated in a distinct **job-cost record**, also called a **job-cost sheet**. The job-cost sheet accumulates all the costs assigned to a distinct job. Cost accumulation is done electronically, and information is available to authorized managers through the company's management information system.

Step 2: Identify the Direct Costs of the Distinct Job The relevant direct and indirect cost pools are identified according to the characteristics of a job. When the job output is a product such as a smartphone, direct materials for specific computer chips and software will generate significant costs. The trace for direct materials will be materials requisition records for each job or service that contain the quantity and cost of the materials.

Customizing products often takes considerable additional direct manufacturing labour. In this case, customers who request the customization should be willing to pay for the added value, which includes bearing a larger proportion of indirect costs like fringe benefits. The more direct labour used in a customized job, the higher the indirect cost of fringe benefits. It makes sense to reflect this economic fact by having this customer pay more indirect costs of finishing the product than another customer who has not demanded additional customization.

When the job output is a service such as an audit, the direct professional labour will generate significant costs. This pattern of costs is typical of the professional service industry, which is labour intensive. **Labour intensive** means that labour costs are a significant proportion of total costs. Accounting for direct labour also requires either a hardcopy or electronic trace of the labour time used, the cost per hour, and the distinct job. There may be many different types of direct labour used, depending on the job requirements. Each type, volume, and cost of direct labour-hour must be identified.

Step 3: Select the Cost Allocation Base to Use for Allocating the Indirect Cost Pool to a Distinct Job Indirect costs are incurred because some common inputs are necessary to do all jobs, such as maintenance, utilities, custodial services, and rework. These common costs must be allocated or divided up among all jobs because they are not incurred equally for all types of jobs. The cost allocation base is a quantity of direct inputs because this is measured in a company's MIS and is a reasonable measure of benefit or value added to distinct types of jobs.

Step 4: Identify and Add All the Indirect Costs into One Indirect Cost Pool All the MOH or indirect production costs associated with the use of common inputs are summed into one MOH cost pool. These costs will be recovered when the customer pays for the finished job. At the time of sale, the distinct job production costs become cost of goods sold (COGS). Sometimes companies will base a job-costing system on more than one indirect cost pool—one for machine- and one for labour-intensive jobs. The company would choose a machine-related input as the cost allocation base for the machine cost pool and a labour-related input for the labour cost pool.

Step 5: Compute the Indirect Cost Allocation Rate For each MOH cost pool, the **actual indirect cost allocation rate** is calculated by dividing the actual MOH cost pool (determined in Step 4) by the actual total quantity of the cost allocation base (determined in Step 3). The result is the average cost per unit of shared resources used by all types of jobs (see Exhibit 4-2).

Step 6: Compute the Indirect Cost Assigned to the Distinct Job The indirect costs of a distinct type of job are computed by multiplying the indirect cost rate by the actual quantity of the allocation base used in completing the distinct job.

Step 7: Compute the Total Cost of the Distinct Job by Adding All Direct and Indirect Costs Assigned to the Job The job cost is the *sum* of all direct and indirect costs assigned to the distinct job. The direct cost pools have been traced and the indirect costs have been allocated to each type of job.

JOB COSTING: ACTUAL COST ASSIGNMENT TO A DISTINCT SERVICE

2 Apply the decision framework in a seven-step method to assign total actual costs to a distinct service.

Now that we know the steps involved in assigning costs to jobs, let's go through these steps to assign total actual costs to a distinct service.

Lukach, Sulky, and Associates Ltd. (LSAL) is a public accounting firm. Using the decision framework, LSAL has identified their key problem as how to rank their audit jobs from most to least profitable. Gathering information already available internally on last year's actual costs, they identified relevant cost pools. Relevant cost pools distinguish the resources that are consumed differently by different types of audit jobs.

LSAL then predicted next year's budgeted operating income. What remains to be completed is the seven-step job-cost analysis to assign costs to jobs. Then the different types of audit jobs can be ranked from most to least profitable. This analysis will guide the firm in both future marketing plans and performance management. LSAL plans to continuously monitor and compare next year's actual performance to the predicted performance in the budget. Based on this feedback, managers will be able to identify the critical success factors for their most profitable audits. The firm can then choose the most profitable service mix and focus their efforts and resources on increasing those types of audit jobs.

LSAL may also decide that it is in their best economic interests to refuse less profitable types of audit jobs, or even fire existing low-profit clients. The reason is that LSAL has a limited number of 180 professionals working 1,600 direct labour hours per year at $300/DLH. LSAL will lose profitable opportunities when the hours are consumed by low-profit audits. This is called an **opportunity cost**, which is the contribution to income lost or foregone by not using a limited resource in its best alternative use.

We can follow the decision framework to solve LSAL's problem of how to rank different types of audit jobs. The most recent year-end statement of income and the budgeted statement of income for the coming year are presented in Exhibit 4-6.

There are a couple of notable features to this summary. First, LSAL predicts a drop in profitability from $20,408 to $18,390 million next year. This suggests that LSAL needs to improve profitability. Second, the professional labour costs were $82,260,000. General and administrative labour costs were $24,040,000. Total labour operating expenses were $106,300,000 ($82,260,000 + $24,040,000). More than 77% ($82,260,000 ÷ $106,300,000) of all labour costs pay the professional auditors. Overall, LSAL is very labour intensive.

SEVEN-STEP JOB COST ASSIGNMENT OF COSTS TO A DISTINCT SERVICE

Exhibit 4-7 graphically illustrates the key concepts and how they relate in creating an actual job-costing system for a service company. This is a visual tool for you to use when you analyze the data provided for a job-costing system. The Exhibit distinguishes between the allocation of MOH (Steps 1–6), the tracing of direct costs (at the bottom of the Exhibit), and the assignment of both costs to each job (Step 7). The varying sizes of the cost boxes signify that indirect and direct costs assigned to each distinct job vary. If this were not true, then job costing would not be useful and costs should simply be averaged across all jobs because they use identical quantities of shared inputs and must incur costs at an identical rate.

EXHIBIT 4-6
Lukach, Sulky, and Associates Actual and Budgeted Operating Income

Lukach, Sulky, and Associates (in $ thousands)	Actual 2011		Budget 2012	
Operating revenue		$168,120		$177,360
Operating expenses				
Professional labour		82,260		86,400*
General and administrative	$11,040		$12,180	
Administrative support	9,180		9,600	
Information systems	3,000		3,960	
Other administrative	820	24,040	1,038	26,778
Operating income after labour expenses		$61,820		$64,182
Non-labour operating expenses				
Liability insurance	8,826		12,960	
Professional development	3,240		5,280	
Rent	11,478		12,000	
Office services	7,980		8,580	
Travel	4,308		4,620	
Other non-labour	5,580	41,412	2,352	45,792
Operating income		$20,408		$18,390

$$\frac{180 \text{ professionals} \times 1{,}600 \text{ billable hours} \times \$300/\text{DLH}}{\$1{,}000} = \$86{,}400$$

Step 1: Identify the Distinct Type of Job That Is the Cost Object The job is the audit of Simpson's Editorial Services, a very successful professional service. All costs of this audit must be assigned to the job before its profitability can be ranked among other types of audit jobs.

Step 2: Identify the Direct Costs of the Distinct Job The direct costs were 800 professional labour hours at $300/DLH for a total of $240,000.

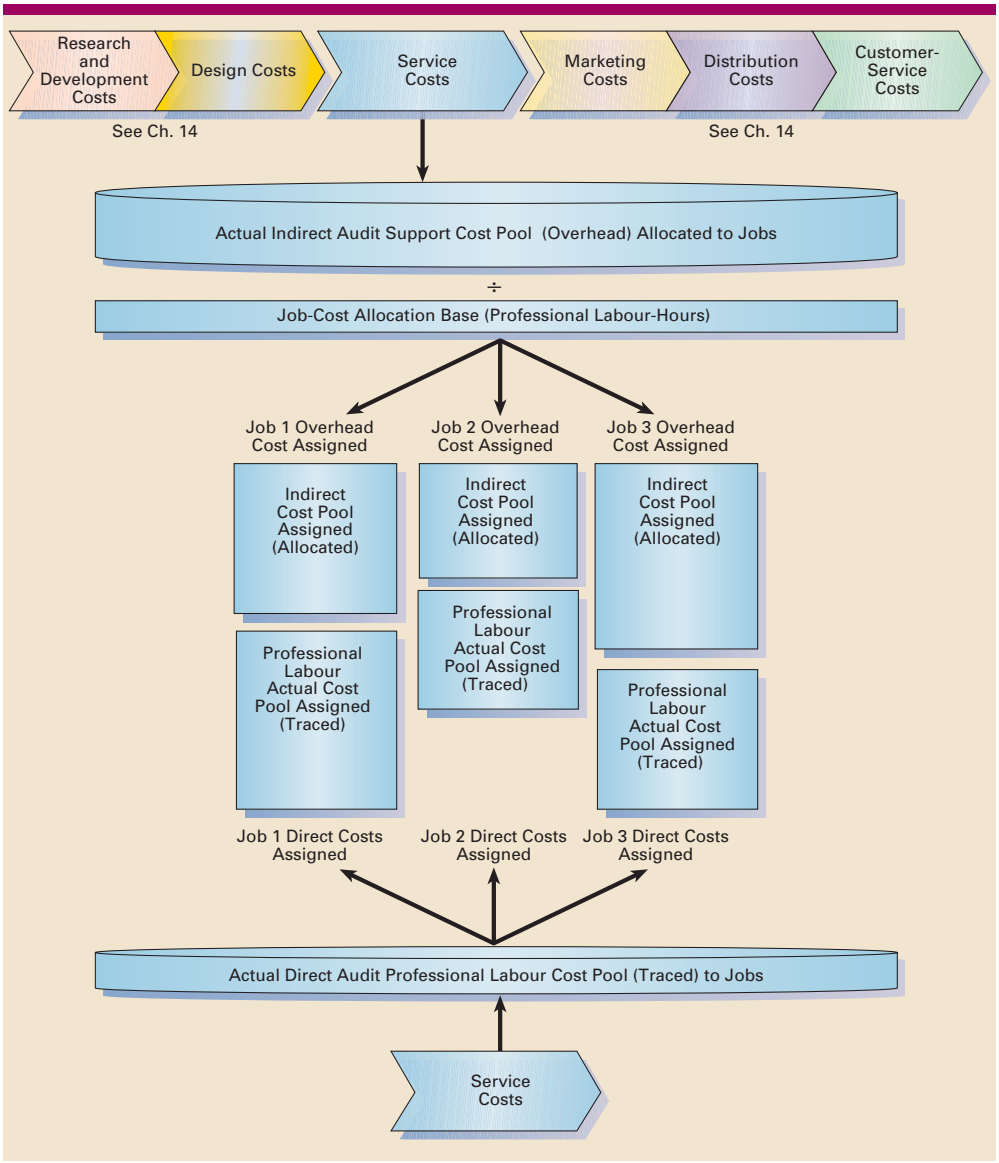
Step 3: Select the Cost Allocation Base to Use for Allocating the Indirect Cost Pool to a Distinct Job There is only one category of direct costs, professional labour. LSAL managers assume that changes in professional labour-hours will explain a sufficient proportion of the change in the total indirect cost pool. The cost allocation base will be the total professional labour-hours actually consumed by LSAL last year. Exhibit 4-6 reports that the total professional labour cost at $300/DLH was $82,260,000, so the total DLH must have been 274,200 hours ($82,260,000 ÷ $300).

Step 4: Identify and Add All the Indirect Costs into One Indirect Cost Pool In Exhibit 4-6, the actual total operating expenses have already been calculated as $147,712,000 ($82,260,000 + $24,040,000 + $41,412,000), of which actual direct professional labour costs were $82,260,000. The indirect cost pool must be $65,452,000 ($147,712,000 – $82,260,000).

Step 5: Compute the Indirect Cost Allocation Rate Ways to resolve disputes over what quantity of what input should be in the cost allocation base are discussed in Chapter 10. Changes in the indirect cost pool should be reasonably explained by changes in the quantity of inputs in the cost allocation base. In this way, LSAL will assign costs in a way that reflects the economic facts of completing the job. The cost allocation rate for the single indirect cost pool using the cost allocation base of quantity of actual professional labour-hours is $65,452,000 ÷ 274,200 DLH = $238.7017/DLH (4 decimals).

EXHIBIT 4-7

Job-Costing Overview for Assigning Actual Total Costs of Three Service Jobs



Step 6: Compute the Indirect Cost Assigned to the Distinct Job The Simpson Editorial Services audit consumed 800 professional labour-hours. The total indirect cost assigned to this job at the cost allocation rate of $238.7017/DLH is $190,961 (rounded).

Step 7: Compute the Total Cost of the Distinct Job by Adding All Direct and Indirect Costs Assigned to the Job Having spent time choosing a cost allocation base and calculating the cost allocation rate, managers must not forget to add the direct costs of the job to the allocated indirect costs to obtain the total job cost. The total cost of the Simpson Editorial Services audit was $430,961, as summarized in the table below:

Simpson Editorial Services Audit

	Professional Labour-Hours (1)	Direct Professional Labour Rate (2)	Direct Professional Labour Cost Pool (3) = (1) × (2)
Direct cost pool—professional labour	800	$300	$240,000
Indirect cost pool—audit support	800	$238.7017	190,961
Total job cost			$430,961

JOB COSTING: ACTUAL COST ASSIGNMENT TO A DISTINCT PRODUCT

Apply the decision framework in a seven-step method to assign total actual costs to a distinct product. 3

We can use the same decision framework to assign total actual costs to a distinct product. Robinson Company manufactures and installs customized machinery for the paper-making industry. In early 2012, BC Pulp and Paper Company (BCPP) sent Robinson a request for a proposal (RFP). Robinson will be among many competitors bidding to manufacture and install a new paper-making machine for BCPP. The RFP has both a product and service component because Robinson must install the completed machine.

The problem is determining whether Robinson's successful bid will be profitable. The profitability of the BCPP job depends on its cost and how low Robinson must bid to successfully obtain the job. The managers at Robinson have gathered relevant information on the specifications of the BCPP machine, the likely competitors and their resources, and the internal strengths and weaknesses at Robinson. After analyzing this information, they decided that the BCPP job fit the profile of a profitable job for Robinson and succeeded in the bid of $10,000 plus a profit of 50%, or $5,000 ($10,000 × 0.5 = $5,000), so $15,000 altogether. Robinson will monitor the BCPP job closely to obtain feedback comparing actual to budgeted costs. Cost overruns will be investigated, explained, and hopefully remedied to allow Robinson to realize its $5,000 expected profit.

SEVEN-STEP JOB COST ASSIGNMENT OF COSTS TO A DISTINCT PRODUCT

The seven steps to assign costs will be applied to the completed job, BCPP. The manual record for the BCPP job is part of Robinson's MIS and summarizes all costs for the distinct job as shown in Exhibit 4-8. These data are the basis for the assignment of costs to BCPP.

Step 1: Identify the Distinct Job That Is the Chosen Cost Object The cost object is job BCPP, manufacturing a paper-making machine for the BC Pulp and Paper Company in 2012. Throughout the BCPP job, Robinson's managers and management accountants gather information from source documents and job-cost records with the BCPP identification code.

Step 2: Identify the Direct Costs of the Distinct Job Robinson identifies direct materials and direct manufacturing labour cost pools. As required by the specifications, Robinson's manufacturing engineer will issue requisitions for direct materials. The basic source document, a **materials-requisition record**, lists the cost of direct materials used on each specific job in a specific department. The $112 actual total cost also appears on the BCPP job-cost record in Exhibit 4-8 in the Direct Materials section. The actual total direct materials cost was $4,606.

The second direct cost pool is direct manufacturing labour. The source document is called a **labour-time record (time sheet** or **time card)**. This record lists the amount of labour-time in direct manufacturing labour hours (DMLH) for the BCPP job, the date, the employee identification, the hourly rate in $/DMLH, and the total cost of each type of labour used. Notice that two different employees worked on this job for two different time periods and were paid two different hourly rates.

There is collaborating detail about both the direct materials and direct manufacturing labour resources consumed by the BCPP job. Panel A of Exhibit 4-9 shows the materials-requisition record that specifies what quantity of what material was requisitioned, the cost per unit, and the total direct materials cost. Panel B shows the labour-time for employee LT232 (the first DMLH record in Exhibit 4-8).

Notice that G.L. Cook worked on two jobs during the week. The 25 DMLH worked on BCPP is shown in detail day by day. The hourly rate is $18/DMLH and the total cost assigned to BCPP was $450, as shown in line 18 of Exhibit 4-8 under the heading Direct Manufacturing Labour. G.L. Cook, however, also performed 3 DMLH of maintenance. Maintenance is not traced to either job JL 256 or BCPP.

EXHIBIT 4-8

Source Documents at Robinson Company: Job-Cost Record BCPP

File Edit View Insert Format Tools Data Window Help

	A	B	C	D	E	
1			**JOB-COST RECORD**			
2	JOB NO:	BCPP		CUSTOMER:	BC Pulp and Paper	
3	Date Started:	Feb. 4, 2012		Date Completed:	Feb. 28, 2012	
4						
5						
6	**DIRECT MATERIALS**					
7	Date	Materials-		Quantity	Unit	Total
8	Received	Requisition No.	Part No.	Used	Cost	Costs
9	Feb. 4, 2012	2012: 198	MB 468-A	8	$14	$ 112
10	Feb. 4, 2012	2012: 199	TB 267-F	12	63	756
11						•
12						•
13	Total					$ 4,606
14						
15	**DIRECT MANUFACTURING LABOUR**					
16	Period	Labour-Time	Employee	Hours	Hourly	Total
17	Covered	Record No.	No.	Used	Rate	Costs
18	Feb. 4-10, 2012	LT 232	551-87-3076	25	$18	$ 450
19	Feb. 4-10, 2012	LT 247	287-31-4671	5	19	95
20						•
21						•
22	Total					$ 1,579
23						
24	**MANUFACTURING OVERHEAD***					
25		Cost Pool		Allocation-Base	Allocation-	Total
26	Date	Category	Allocation-Base	Quantity Used	Base Rate	Costs
27	Dec. 31, 2012	Manufacturing	Direct Manufacturing	88 hours	$45	$ 3,960
28			Labour-Hours			
29						
30	Total					$ 3,960
31	**TOTAL MANUFACTURING COST OF JOB**					$10,145
32						
33						
34	*The Robinson Company uses a single manufacturing overhead cost pool. The use of multiple overhead cost pools					
35	would mean multiple entries in the "Manufacturing Overhead" section of the job-cost record.					
36						

EXHIBIT 4-9

Source Documents at Robinson Company: Materials-Requisition Record and Labour-Time Record

PANEL A:

MATERIALS-REQUISITION RECORD

Materials-Requisition Record No. 2012: 198
Job No. BCPP Date: FEB. 4, 2012

Part No.	Part Description	Quantity	Unit Cost	Total Cost
MB 468-A	Metal Brackets	8	$14	$112

Issued By: B. Clyde Date: Feb. 4, 2012
Received By: L. Daley Date: Feb. 4, 2012

PANEL B:

LABOUR-TIME RECORD

Labour-Time Record No: LT 232
Employee Name: G. L. Cook Employee No: 551-873-078
Employee Classification Code: Grade 3 Machinist
Hourly Rate: $18
Week Start: Feb. 4, 2012 Week End: Feb. 10, 2012

Job. No.	M	T	W	Th	F	S	Su	Total
BCPP	4	8	3	6	4	0	0	25
JL 256	3	0	4	2	3	0	0	12
Maintenance	1	0	1	0	1	0	0	3
Total	8	8	8	8	8	0	0	40

Supervisor: R. Stuart Date: Feb. 4, 2012

Step 3: Select the Cost Allocation Base to Use for Allocating the Indirect Cost Pool to a Distinct Job Indirect manufacturing costs are costs that are necessary to do a job but cannot be traced to a specific job. Different jobs require different quantities of indirect resources. For example, Exhibit 4-9 shows that Mr. Cook's maintenance is not the same each day of the week. The objective is to allocate the actual total costs of indirect resources in a systematic way to their related jobs.

Robinson chooses direct manufacturing labour-hours as the allocation base for linking all actual indirect MOH to jobs. In its labour-intensive environment, Robinson believes that when the quantity of direct manufacturing labour-hours consumed changes, it will also explain a sufficient amount of change in the quantity of indirect costs consumed by each job. Robinson recorded a *total* of 27,000 actual direct manufacturing labour-hours for all jobs.

Step 4: Identify and Add All the Indirect Costs into One Indirect Cost Pool Actual total indirect manufacturing overhead costs have been accumulated as $1,215,000 for all jobs undertaken in the year.

Step 5: Compute the Indirect Cost Allocation Rate For each cost pool, the actual indirect cost rate is calculated by dividing actual total indirect costs in the pool (determined in Step 4 as $1,215,000) by the actual total quantity of the cost allocation base (determined in Step 3 as 27,000 DMLH). The cost allocation rate is:

$$\text{Actual manufacturing overhead rate} = \frac{\text{Actual manufacturing overhead costs}}{\text{Actual total quantity of cost allocation base}}$$

$$= \frac{\$1{,}215{,}000}{27{,}000 \text{ direct manufacturing labour-hours}}$$

$$= \$45 \text{ per direct manufacturing labour-hour}$$

Step 6: Compute the Indirect Cost Assigned to the Distinct Job Robinson's actual cost records for the year show that the total BCPP direct labour-hours consumed was 88 DMLH. The total MOH was $3,960 ($45/DMLH × 88 DMLH = $3,960).

Step 7: Compute the Total Cost of the Distinct Job by Adding All Direct and Indirect Costs Assigned to the Job From Exhibit 4-8, the actual total of direct and indirect costs for the BCPP job was $10,145.

Direct manufacturing costs		
Direct materials	$4,606	
Direct manufacturing labour	1,579	$ 6,185
Manufacturing overhead costs		
($45 per direct manuf. labour-hour × 88 hours)		3,960
Total manufacturing costs of job BCPP		$10,145

Recall that Robinson bid a price of $15,000 for the job. At that revenue, the actual-costing system shows a gross margin of $4,855 ($15,000 – $10,145) and a gross-margin percentage of 32.4% ($4,855 ÷ $15,000 = 0.324).

Robinson's manufacturing managers and sales managers can use the gross margin and gross-margin percentage calculations to compare the profitability of different jobs to understand the reasons why, for example, the BCPP job failed to meet its expected gross margin of $5,000 ($15,000 − $10,000) and gross-margin percentage of 33.3% ($5,000 ÷ $15,000). Overall, without a job-costing system, managers would have a very difficult time determining the profitability of specific jobs and identifying areas for improvement.

ADDITIONAL POINTS TO CONSIDER WHEN CALCULATING JOB-COST ALLOCATION RATES

Information technology simplifies the tracing of costs to jobs. If direct manufacturing labour-hours is used as the cost allocation base, very refined systems can trace direct manufacturing labour in minutes or longer intervals to each job. Employees simply scan their identification card and select the job identification code when they begin and again when they end their task. The computer then reports not only the

CONCEPTS IN ACTION—GOVERNANCE

Job Costing on the Next-Generation Military Fighter Plane

Northrop Grumman, Inc. is a leading provider of systems and technologies for the US Department of Defense. Competitive bidding processes and increased public and congressional oversight make understanding costs critical in pricing decisions, as well as in winning and retaining government contracts. Each job must be estimated individually because the distinct outputs consume different amounts of Northrop Grumman's resources.

A project team of Northrop Grumman, Lockheed Martin, and BAE Systems was awarded the System Design and Demonstration contract to build the F-35 Lightning II aircraft—also known as the Joint Strike Fighter—in late 2001. This project, worth over $200 billion, will create a family of supersonic, multi-role fighter airplanes designed for the militaries of the United States, United Kingdom, Italy, The Netherlands, Turkey, Canada, Australia, Denmark, and Norway. In December 2006, the F-35 Lightning II successfully completed its first test flight; it appears in this photograph during subsequent testing at Edwards Air Force Base, California, in 2009.

The project team for the F-35 Lightning II uses a job-costing system. There are two direct cost pools, material and manufacturing labour. The remaining costs are accumulated in one overhead cost pool. The cost allocation base is the total budgeted direct materials cost. This job-costing system allows managers to assign costs to processes and projects. Managers use this system to actively manage costs. Program representatives from the Department of Defense and members of Congress have access to clear, concise, and transparent costing data when they complete their audits.

Sources: Conversations with Northrop Grumman, Inc. management, www.jsf.mil, and various program announcements and press releases.

DMLH spent, but also the indirect costs of fringe benefits and rework for each job. For fixed cost allocation, when the cost object is a job it is sensible to collect the fixed costs incurred during the entire time period of the job.

Robinson Company computes indirect cost rates in Step 5 of the job-costing system (p. 117) on an annual basis. There are two reasons for using longer periods, such as a year, to calculate indirect cost rates:

- **Seasonal patterns.** The shorter the period is, the greater the influence of seasonal patterns on the amount of costs. For example, if indirect cost rates were calculated each month, then heating costs would be charged to production only during the winter months. An annual period incorporates the effects of all four seasons into one annual indirect cost rate.
- **Unitized fixed costs.** Longer periods to produce jobs mean that the unitized fixed cost portion of the machine and other fixed cost pools will be spread out more evenly. Even if output varies from month to month for a single job, the point is to cost the job, not the time period.

An audit firm has a highly seasonal workload. Tax advice accounts for more than 80% of the workload from January through April. Given the following mix of costs for a high-output month such as April and a low-output month such as July, actual indirect cost allocation rates fluctuate by almost 300%. If the low cost allocation rate were charged in April, then clients would be very pleased. If the high cost allocation rate were charged in July, then clients would leave. If costs are allocated and charged at the time they are incurred, then July clients are not paying a fair share of fixed resources for an identical job in April. July clients are penalized for the time of year the resources are consumed. Ultimately the firm could not cover its total annual fixed indirect costs.

	Indirect Costs			Professional Labour-Hours (4)	Allocation Rate per Professional Labour-Hour (5) = (3) ÷ (4)
	Variable (1)	Fixed (2)	Total (3)		
High-output month	$40,000	$60,000	$100,000	3,200	$31.25
Low-output month	10,000	60,000	70,000	800	87.50

METHODS AVAILABLE TO CALCULATE COST RATES AND ASSIGN JOB COSTS

Distinguish among three methods—actual, budgeted, and normal—to calculate job-cost allocation rates and assign indirect costs to a distinct job. 4

Exhibit 4-10 summarizes three methods that are available to calculate cost rates and assign job costs: actual, budgeted, and normal. The methods illustrate three GAAP-compliant combinations of actual and budgeted values used to calculate cost allocation rates and *assign* costs to distinct jobs. The methods differ in the use of either the budgeted or actual quantity of the cost allocation base used when assigning costs to distinct jobs. Standard costing, which is discussed in Chapters 9 and 17, differs from budgeted costing and includes normal levels of materials, supplies, labour, efficiency, and capacity utilization. The standard costs are kept current through a regular process of revision.

ACTUAL COSTING

Actual costing is a costing system that traces direct costs to a distinct type of job by using the actual direct cost rates. The direct rates are calculated by dividing the actual direct job cost pools by the actual quantity of direct inputs. The actual indirect cost pool is divided by the actual quantity of the direct input chosen as the cost allocation base to calculate the actual indirect cost allocation rate. To assign some amount of the indirect cost pool to one distinct type of job, the actual quantity of the direct cost allocation base used to complete the job is multiplied by the actual indirect cost allocation rate.

This method looks backwards to historical information as part of Step 5 in the decision framework. It is best used to provide feedback information to assess the profitability of each job in comparison to its expected profitability. The benefit of using an actual cost system is that the job-costing information accurately reflects economic facts.

However, the accounting cycle produces a lag between when the cost was incurred and when it was paid. In addition, there is often a wait for the actual information to be recorded within the accounting system, and data entry may be inaccurate. Finally, the job has to be finished before the final cost information is known. Unfortunately for many jobs, such as the construction of the Confederation Bridge, which links Prince Edward Island to New Brunswick, cost information to assess profitability was needed long before job-completion at the end of four years. Timeliness is an important characteristic that defines relevant information.

In addition, historical information may not be the best indicator of future costs. For example, the worldwide 2007 recession decreased profits in all industries worldwide. Fixed costs could not be reduced fast enough to keep pace with falling demand. Unsold inventory built up based on normally expected demand and profit fell because no one was buying. Managers need better than a 90- to 365-day-old set of information based on business as usual to adequately respond to these unpredicted threats to profit. As uncertainty and risk escalate, predictions or budgets need to

EXHIBIT 4-10
Methods to Calculate Cost Rates and Assign Job Costs

	Direct Cost Pools	Indirect Cost Pool
ACTUAL COSTING	Actual rate × Actual Q/Job	Actual indirect cost allocation rate × Actual Q/Job
BUDGET COSTING	Budgeted rate × Actual Q/Job	Budgeted indirect cost allocation rate × Actual Q/Job
NORMAL COSTING	Actual rate × Actual Q/Job	Budgeted indirect cost allocation rate × Actual Q/Job

Actual indirect cost allocation rate = Actual indirect cost pool ÷ Actual Q of direct inputs used
Budgeted indirect cost allocation rate = Budgeted cost pool ÷ Budgeted Q of direct inputs used

The Q of direct inputs used to allocate the Indirect Cost Pool was selected by managers as the cost allocation base.

change to reflect the economic reality outside a company. This is at least as important as gathering internal cost information from the company itself on the profitability of a distinct type of finished job.

BUDGETED COSTING

Budgeted job cost assignment is useful in service industries because bonuses, an indirect labour cost, are awarded after year-end when all professional billable hours are known. The indirect cost rate will be mismatched to actual economic events. Peak-period overtime worked in, for example, an audit company such as LSAL, is not a predictable amount and, for service companies who are growing their client base, is not readily budgeted. Nevertheless, overtime services provided to complete jobs during peak period is an additional input consumed by some jobs but not others. The customer requiring the overtime should pay for it; therefore, LSAL must use job costing to allocate indirect labour costs appropriately.

LSAL accumulates direct professional labour costs in one cost pool and direct professional labour-hours (DLH) in its MIS. These amounts are used to calculate the direct labour cost rate. Overtime and bonuses arise from business growth and are accumulated with other common costs in one indirect cost pool. In 2012, LSAL budgeted total direct labour costs of $14,400,000, total indirect costs of $12,960,000, and total DLH of 288,000 for the year. In this case, the rate is:

$$\text{Budgeted direct labour cost rate} = \frac{\text{Budgeted total direct labour costs}}{\text{Budgeted total direct labour–hours}}$$

$$= \frac{\$14{,}400{,}000}{288{,}000} = \$50/\text{DLH}$$

Assuming only one indirect cost pool and total DLH as the cost allocation base, the indirect cost allocation rate is:

$$\text{Budgeted indirect cost rate} = \frac{\text{Budgeted total costs in the indirect costs pool}}{\text{Budgeted total quantity of cost allocation base}}$$

$$= \frac{\$12{,}960{,}000}{288{,}000\ \text{DLH}} = \$45/\text{DLH}$$

Suppose an audit of LSAL's client Tracy Transport, completed during the peak period in March 2012, uses 800 DLH. LSAL calculates the direct costs of the Tracy Transport audit by multiplying the budgeted direct cost rate by the actual quantity of the DLH for the job. LSAL allocates indirect costs to the Tracy Transport audit by multiplying the budgeted indirect cost allocation rate by the actual quantity of the cost allocation base used in this job. On this basis, the cost of the Tracy Transport audit is:

Direct labour costs, $50 × 800	= $40,000
Indirect costs allocated, $45 × 800	= $36,000
Total	= $76,000

At the end of the year, the direct costs traced to jobs using budgeted rates will rarely equal the actual direct costs because the actual and budgeted rates are developed at different points in time using different information. End-of-period adjustments for underallocated or overallocated direct costs must be made in the same way that adjustments are made for underallocated or overallocated indirect costs. Three methods for making these adjustments—adjusted allocation rate, proration, and write-off—are discussed at the end of this chapter.

NORMAL COSTING

Normal costing is more complex than an actual job-costing system. The normal method differs from the actual method in the way indirect costs are assigned to a distinct job. A normal job-costing system still traces direct costs to a distinct type of job by multiplying the actual direct cost rates by the actual quantities of the direct cost inputs, but indirect costs are allocated based on the *budgeted (predetermined)* indirect cost allocation rates multiplied by the actual direct input quantity of the cost allocation base used by each distinct type of job. The difference is that the indirect cost allocation rate is calculated using a budgeted indirect cost pool divided by an indirect quantity of the cost allocation base used for all jobs. Source documents identify the actual quantities of direct materials, equipment, and labour used as each distinct type of job is completed.

We illustrate normal costing for the Robinson Company example using the seven-step procedure presented earlier. The following budgeted data for 2012 are for its manufacturing operations:

	Budget
Total manufacturing overhead costs	$1,120,000
Total direct manufacturing labour-hours	28,000

Steps 1 and 2 are exactly as before: Step 1 identifies BCPP as the cost object; Step 2 calculates actual direct material costs of $4,606, and actual direct manufacturing labour costs of $1,579. Recall from Step 3 that Robinson uses a single cost allocation base, direct manufacturing labour-hours, to allocate all manufacturing overhead costs to jobs. The budgeted quantity of direct manufacturing labour-hours for 2012 is 28,000 hours. In Step 4, Robinson groups all the indirect manufacturing costs into a single manufacturing overhead cost pool. In Step 5, the budgeted manufacturing overhead rate for 2012 is calculated as:

$$\text{Budgeted manufacturing overhead rate} = \frac{\text{Budgeted annual manufacturing indirect costs}}{\text{Budgeted annual quantity of the cost allocation base}}$$

$$= \frac{\$1{,}120{,}000}{28{,}000 \text{ direct manufacturing labour-hours}}$$

$$= \$40 \text{ per direct manufacturing labour-hour}$$

In Step 6, under a normal costing system, the allocated MOH costs are $3,520:

$$\text{Manufacturing overhead costs allocated to BCPP} = \text{Budgeted manufacturing overhead rate} \times \text{Actual quantity of direct manufacturing labour-hours}$$

$$= \$40 \text{ per direct manuf. labour-hour} \times 88 \text{ direct manufacturing labour-hours}$$

$$= \$3{,}520$$

In Step 7, the cost of the job under normal costing is $9,705:

Direct manufacturing costs		
Direct materials	$4,606	
Direct manufacturing labour	1,579	$6,185
Manufacturing overhead costs		
($40 per direct manufacturing labour-hour × 88 actual direct manufacturing labour-hours)		3,520
Total manufacturing costs of job		$9,705

The manufacturing cost of the BCPP job is $440 lower under normal costing ($9,705) than it is under actual costing ($10,145) because the budgeted indirect cost rate is $40 per hour, whereas the actual indirect cost rate is $45 per hour. The difference in rates, ($45 – $40) × 88 actual direct manufacturing labour-hours = $440.

As we discussed previously, manufacturing costs of a job are available much earlier under a normal costing system. Consequently, Robinson's manufacturing and sales managers can evaluate the profitability of different jobs, the efficiency with which the jobs are done, and the pricing of different jobs as soon as the jobs are completed, while the experience is still fresh in everyone's mind. Another advantage of normal costing is that corrective actions can be implemented much sooner. At the end of the year, though, costs allocated using normal costing will not, in general, equal actual costs incurred. If material, adjustments will need to be made so that the cost of jobs and the costs in various inventory accounts are based on actual rather that normal costing.

A NORMAL JOB-COSTING SYSTEM AND COST FLOW

5 Analyze the flow of costs from direct and indirect cost pools to inventory accounts, including adjustments for over- and underallocated costs.

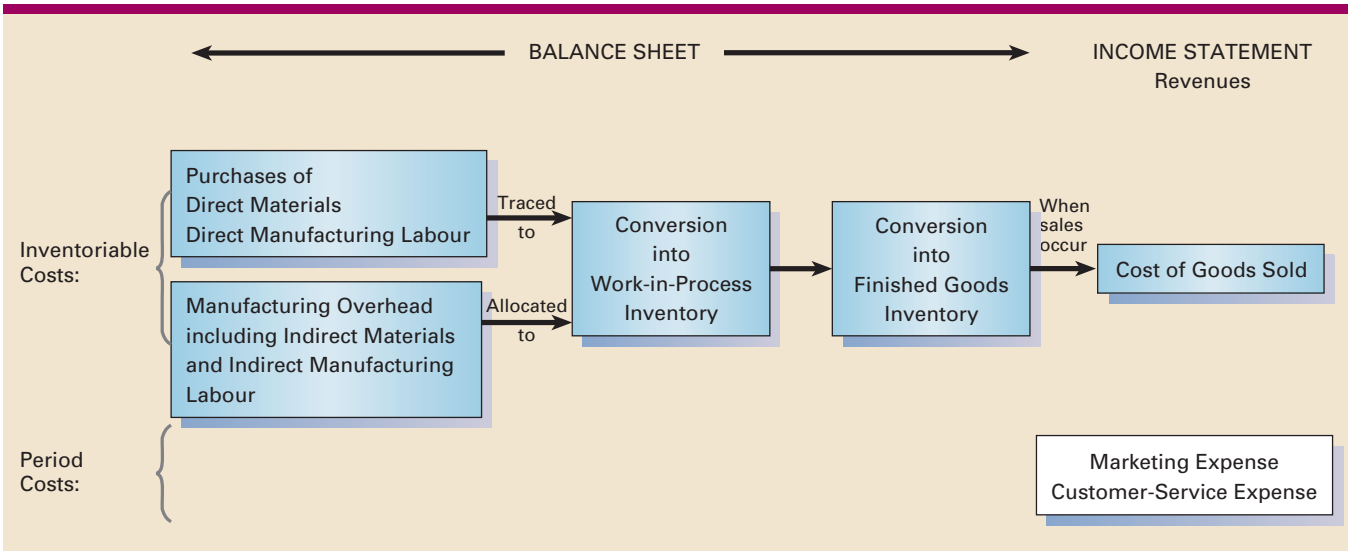
We now explain cost flow for a company with a normal job-costing system, Robinson Company. The following illustration considers events that occurred in February 2012. Exhibit 4-11 illustrates a broad framework for understanding the flow of costs and inventory valuation in job costing.

The upper part of Exhibit 4-11 shows the inventoriable costs from the purchase of materials and other manufacturing inputs, which flow during conversion into work-in-process and finished goods inventory. The sale of BCPP triggers the transfer of these costs from cost of goods manufactured (COGM) to the cost of goods sold (COGS) account.

Direct materials used and direct manufacturing labour can be easily traced to BCPP through the electronic source documents. These costs do not disappear even if they are paid. Rather, these costs are transferred to work-in-process inventory on the balance sheet. These direct costs are expended to transform or convert raw materials into finished goods inventory. As the goods are converted, value is added, which is why the work-in-process is a current asset. With more conversion, work-in-process inventory will provide future benefit in the form of revenue in a time period of less than 12 months.

Robinson also incurs MOH (including indirect materials and indirect manufacturing labour). These indirect support costs cannot be readily traced to BCPP because the inputs are common and used in different amounts by all of Robinson's jobs. First MOH is accumulated in an MOH ledger account and then allocated and

EXHIBIT 4-11
Flow of Costs in Job Costing



assigned to individual jobs. Once assigned to a job, MOH is transferred to the work-in-process inventory account. But Robinson is using a normal costing method and a budgeted indirect cost allocation rate, although it is using actual direct manufacturing labour-hours per job to assign the MOH to each job. Normal costing will create a discrepancy for which an accounting adjustment must be made, between what is recorded as the job is completed and the actual costs incurred.

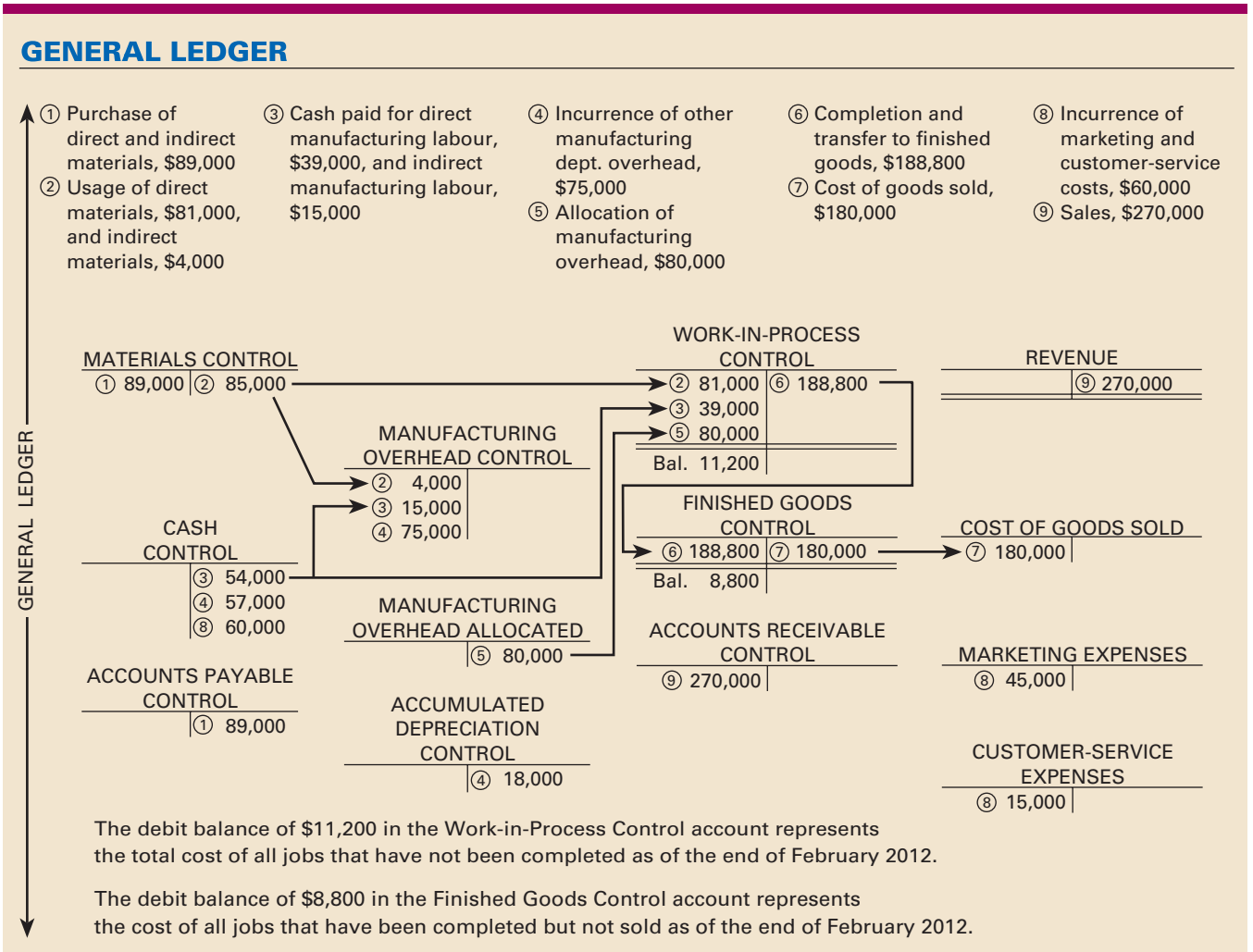
Once complete, all assigned BCPP costs are transferred to the finished goods inventory account on the balance sheet. Only when finished goods are sold is an expense, cost of goods sold, recognized in the income statement and matched against revenue earned from sales.

GENERAL LEDGER

You know by this point that a job-costing system has a separate job-cost record for each job. A summary of the job-cost record is typically found in a subsidiary ledger. The general ledger account Work-in-Process Control presents the total of these separate job-cost records pertaining to all unfinished jobs. The job-cost records and Work-in-Process Control account track job costs from when jobs start until they are complete.

Exhibit 4-12 shows T-account relationships for Robinson Company's general ledger. The general ledger gives a "bird's-eye view" of the costing system. The amounts shown in Exhibit 4-12 are based on the transactions and journal entries that

EXHIBIT 4-12
Normal Job Costing for BCPP: Diagram of General Ledger Relationships for February 2012



The debit balance of $11,200 in the Work-in-Process Control account represents the total cost of all jobs that have not been completed as of the end of February 2012.

The debit balance of $8,800 in the Finished Goods Control account represents the cost of all jobs that have been completed but not sold as of the end of February 2012.

follow. As you go through each journal entry, use Exhibit 4-12 to see how the various entries being made come together. General ledger accounts with "Control" in the titles (for example, Materials Control and Accounts Payable Control) have underlying subsidiary ledgers that contain additional details, such as each type of material in inventory and individual suppliers that Robinson must pay.

A general ledger should be viewed as only one of many tools that assist management in planning and control. To control operations, managers rely on not only the source documents used to record amounts in the subsidiary ledgers, but also nonfinancial information such as the percentage of jobs requiring rework.

EXPLANATIONS OF TRANSACTIONS

We next look at a summary of Robinson Company's transactions for February 2012 and the corresponding journal entries for those transactions.

1. Purchases of materials (direct and indirect) on credit, $89,000.

Materials Control	89,000	
Accounts Payable Control		89,000

2. Usage of direct materials, $81,000, and indirect materials, $4,000.

Work-in-Process Control	81,000	
Manufacturing Overhead Control	4,000	
Materials Control		85,000

3. Manufacturing payroll for February: direct labour, $39,000, and indirect labour, $15,000, paid in cash.

Work-in-Process Control	39,000	
Manufacturing Overhead Control	15,000	
Cash Control		54,000

4. Other manufacturing overhead costs incurred during February, $75,000, consisting of supervision and engineering salaries, plant utilities, repairs, insurance, and plant depreciation. The non-cash item, plant depreciation, was $18,000.

Manufacturing Overhead Control	75,000	
Cash Control		57,000
Accumulated Depreciation Control		18,000

5. Allocation of manufacturing overhead to jobs, $80,000.

Work-in-Process Control	80,000	
Manufacturing Overhead Allocated		80,000

Under normal costing, **manufacturing overhead allocated**—also called **manufacturing overhead applied**—is the amount of manufacturing overhead costs allocated to distinct types of jobs based on the budgeted rate multiplied by the actual quantity of the allocation base used.

In transaction 4, actual overhead costs incurred throughout the month are added (debited) to the Manufacturing Overhead Control account. Manufacturing overhead costs are added (debited) to Work-in-Process Control *only when* manufacturing overhead costs are allocated in transaction 5. The amount allocated will differ from the actual overhead costs.

6. Completion and transfer of individual jobs to finished goods, $188,800.

Finished Goods Control	188,800	
Work-in-Process Control		188,800

7. Cost of goods sold, $180,000.

Cost of Goods Sold	180,000	
Finished Goods Control		180,000

8. Marketing costs for February, $45,000, and customer-service costs for February, $15,000, paid in cash.

Marketing Expenses	45,000	
Customer-Service Expenses	15,000	
Cash Control		60,000

9. Sales revenues, all on credit, $270,000.

Accounts Receivable Control	270,000	
Revenues		270,000

SUBSIDIARY LEDGERS

Exhibits 4-13 and 4-14 present subsidiary ledgers that contain the underlying details—the "worm's-eye view" as opposed to the "bird's-eye view" of the general ledger—such as each type of materials in inventory and costs accumulated in individual jobs. The sum of all entries in underlying subsidiary ledgers equals the total amount in the corresponding general ledger control accounts.

Material Records by Type of Materials The subsidiary ledger for materials at Robinson Company—called *Materials Records*—keeps a continuous record of quantity received, quantity issued to jobs, and inventory balances for each type of material. Panel A of Exhibit 4-13 shows the Materials Record for Metal Brackets (Part No. MB 468-A). Source documents supporting the receipt and issue of materials are scanned into a computer. Software programs then automatically update the

EXHIBIT 4-13

Subsidiary Ledger for Materials, Labour, and Manufacturing Department Overhead 2012*

PANEL A: Materials Records by Type of Materials

Metal Brackets Part No. MB 468-A

Received	Issued				Balance
	Date	Req. No.	Qty.	Rate	Amt.
①	2-4	2012: 198	8	$14	$112
		②			

Copies of invoices or receiving reports

Copies of materials-requisition records

Total cost of all types of materials received in February, $89,000

Total cost of all types of materials issued in February, $81,000

PANEL B: Labour Records by Employee

G. L. Cook Empl. No. 551-873-076

Week Endg.	Job No.	Hours Worked	Rate	Amt.
2-10	BCPP			
	JL 256	25	$18	$450
	Mntnce.	12	18	216
		3	18	54
				$720
2-17		③		

Copies of labour-time record

Total cost of all direct and indirect manufacturing labour incurred in February, $54,000 ($39,000 + $15,000)

PANEL C: Manufacturing Department Overhead Records by Month

February 2012

Indir. Matr. Issued	Indir. Manuf. Labour	Supervn. & Eng.	Plant Ins. & Utilities	Plant Deprn.
②	③	④	④	④
$4,000	$15,000	$44,000	$13,000	$18,000

Copies of materials requisitions

Manuf. labour-time record or payroll analysis

Payroll analysis, invoices, special authorizations

Other manufacturing overhead costs incurred in February, $75,000

*The arrows show how the supporting documentation (for example, copies of materials-requisition records) results in the journal entry number shown in circles (for example, journal entry number 2) that corresponds to the entries in Exhibit 4-12.

EXHIBIT 4-14
Subsidiary Ledger for Individual Jobs 2012*

PANEL A: Work-in-Process Inventory Records by Jobs

Job No. BCPP

In-Process					Completed		Balance	
Date	Direct Materials	Direct Manuf. Labour	Allocated Manuf. Overhead	Total Cost	Date	Total Cost	Date	Total Cost
2-4	$ 112			$ 112				
2-10		$ 450		$ 450				
	•	•		•				
2-28	$4,606	$1,579	$3,520	$9,705	2-28	$9,705	2-28	$0
	②	③	⑤			⑥		

Copies of materials-requisition records

Copies of labour-time records

Budgeted rate × actual direct manuf. labour-hours

Completed job-cost record

Total cost of direct materials issued to all jobs in Feb., $81,000

Total cost of direct manuf. labour used on all jobs in Feb., $39,000

Total manuf. overhead allocated to all jobs in Feb., $80,000

Total cost of all jobs completed and transferred to finished goods in Feb., $188,800

PANEL B: Finished Goods Inventory Records by Job

Job No. BCPP

Received		Issued		Balance	
Date	Amt.	Date	Amt.	Date	Amt.
2-28	$9,705	2-28	$9,705	2-28	$0
⑥		⑦			

Completed job-cost record

Costed sales invoice

Total cost of all jobs transferred to finished goods in Feb., $188,800

Total cost of all jobs sold and invoiced in Feb., $180,000

*The arrows show how the supporting documentation (for example, copies of materials-requisition records) results in the journal entry number shown in circles (for example, journal entry number 2) that corresponds to the entries in Exhibit 4-12.

Materials Records and make all the necessary accounting entries in the subsidiary and general ledgers.

As direct materials are used, they are recorded as issued in the Materials Records. Exhibit 4-13, Panel A shows a record of the Metal Brackets issued for the BCPP machine job. Direct materials are also charged to individual job records, which are the subsidiary ledger accounts for the Work-in-Process Control account in the general ledger. For example, the metal brackets used in the BCPP machine job appear as direct material costs of $112 in the subsidiary ledger under the job-cost record for BCPP (Exhibit 4-14, Panel A). The cost of direct materials used across all job-cost records for February 2012 is $81,000 (Exhibit 4-14, Panel A).

As indirect materials (for example, lubricants) are used, they are charged to the Manufacturing Department overhead records (Exhibit 4-13, Panel C), which comprise the subsidiary ledger for Manufacturing Overhead Control. The Manufacturing Department overhead records accumulate actual costs in individual overhead categories by each indirect cost pool account in the general ledger. Recall that Robinson has only one indirect cost pool: Manufacturing Overhead. The cost of indirect materials used is not added directly to individual job records. Instead, the cost of these indirect materials is allocated to individual job records as a part of manufacturing overhead. Total actual MOH costs of $75,000 were incurred in February.

Labour Records by Employee Labour-time records shown in Exhibit 4-13, Panel B, are the trace for direct manufacturing labour to individual jobs. These records also contain indirect cost information that is accumulated in Manufacturing Department overhead records (Exhibit 4-13, Panel C). The subsidiary ledger for

employee labour records shows the different jobs that G. L. Cook worked on and the $720 of wages owed to G. L. Cook for the week ending February 10. The sum of total wages owed to all employees for February 2012 is $54,000. The job-cost record for BCPP shows direct manufacturing labour costs of $450 for the time G. L. Cook spent on the BCPP machine job (Exhibit 4-14, Panel A). Total direct manufacturing labour costs recorded in all job-cost records (the subsidiary ledger for Work-in-Process Control) for February 2012 is $39,000.

G. L. Cook's employee record shows $54 for maintenance, which is an indirect manufacturing labour cost. The total indirect manufacturing labour costs of $15,000 for February 2012 appear in the Manufacturing Department overhead records in the subsidiary ledger (Exhibit 4-13, Panel C). These costs, by definition, are not traced to an individual job. Instead, they are allocated to individual jobs as a part of manufacturing overhead.

Manufacturing Department Overhead Records by Month The Manufacturing Department overhead records (Exhibit 4-13, Panel C) that make up the subsidiary ledger for Manufacturing Overhead Control show details of different categories of overhead costs such as indirect materials, indirect manufacturing labour, supervision and engineering, plant insurance and utilities, and plant depreciation. The source documents for these entries include invoices (for example, a utility bill) and special schedules (for example, a depreciation schedule) from the responsible accounting officer.

Work-in-Process Inventory Records by Jobs The job-cost record for each individual job in the subsidiary ledger will be debited by the cost of direct materials and direct manufacturing labour used by individual jobs. The job-cost record for each individual job in the subsidiary ledger will also be debited for manufacturing overhead allocated for the actual direct manufacturing labour-hours used in that job. For example, the job-cost record for Job BCPP (Exhibit 4-14, Panel A) shows Manufacturing Overhead Allocated of $3,520 (budgeted rate of $40 per labour-hour × 88 actual direct manufacturing labour-hours used). We assume 2,000 actual direct manufacturing labour-hours were used for all jobs in February 2012, resulting in a total manufacturing overhead allocation of $40 per labour-hour × 2,000 direct manufacturing labour-hours = $80,000.

Finished Goods Inventory Records by Jobs Exhibit 4-14, Panel A, shows that Job BCPP was completed at a cost of $9,705. Job BCPP also simultaneously appears in the finished goods records of the subsidiary ledger. Given Robinson's use of normal costing, cost of goods completed consists of actual direct materials, actual direct manufacturing labour, and manufacturing overhead allocated to each job based on the budgeted manufacturing overhead rate multiplied by the actual direct manufacturing labour-hours. Exhibit 4-14, Panel B, indicates that Job BCPP was sold and delivered to the customer on February 28, 2012.

Other Subsidiary Records Robinson maintains employee labour records in subsidiary ledgers for marketing and customer-service payroll as well as records for different types of advertising costs (print, television, and radio). An accounts receivable subsidiary ledger is also used to record the February 2012 amounts due from each customer, including the $15,000 due from the sale of Job BCPP.

Exhibit 4-15 provides Robinson's income statement for February 2012 using information from entries 7, 8, and 9. If desired, the cost of goods sold calculations can be further subdivided and presented in the format of Exhibit 2-10 (p. 42).

Non-manufacturing Costs and Job Costing Chapter 2 (pp. 46–48) pointed out that companies use product costs for different purposes. The product costs reported as inventoriable costs to shareholders may differ from product costs reported for government contracting and may also differ from product costs reported to managers for guiding pricing and product-mix decisions. Remember, even though marketing and customer-service costs are expensed when incurred for financial

EXHIBIT 4-15

Robinson Company Income Statement for the Month Ending February 2012

Revenue		$270,000
Cost of goods sold ($180,000 + $14,000*)		194,000
Gross margin		76,000
Operating costs		
Marketing costs	$45,000	
Customer-service costs	15,000	
Total operating costs		60,000
Operating income		$ 16,000

*Cost of goods sold has been increased by $14,000, the difference between the Manufacturing Overhead Control account ($94,000) and the Manufacturing Overhead Allocated ($80,000). In a later section of this chapter, we discuss this adjustment, which represents the amount by which actual manufacturing overhead cost exceeds the manufacturing overhead allocated to jobs during February 2012.

accounting purposes, companies often trace or allocate these costs to individual jobs for pricing, product-mix, and cost-management decisions.

To identify marketing and customer-service costs of individual jobs, Robinson can use the same approach to job costing described earlier in this chapter in the context of manufacturing. Assume marketing and customer-service costs have the same cost allocation base, revenues, and are included in a single cost pool. Robinson can then calculate a budgeted indirect cost rate by dividing budgeted indirect marketing and customer-service costs by budgeted revenues. Robinson can use this rate to allocate these indirect costs to jobs. For example, if this rate were 15% of revenues, Robinson would allocate $2,250 to Job BCPP ($0.15 \times \$15{,}000$, the revenue from the job). By assigning both manufacturing costs and non-manufacturing costs to jobs, Robinson can compare all costs against the revenues that different jobs generate.

BUDGETED INDIRECT COSTS AND END-OF-ACCOUNTING-YEAR ADJUSTMENTS

Using budgeted indirect cost rates and normal costing instead of actual costing has the advantage that indirect costs can be assigned to individual jobs on an ongoing and timely basis, rather than only at the end of the fiscal year when actual costs are known. However, budgeted rates are unlikely to equal actual rates because they are based on estimates made up to 12 months before actual costs are incurred. We now consider adjustments that are needed when, at the end of the fiscal year, indirect costs allocated differ from actual indirect costs incurred.

Underallocated indirect costs occur when the allocated amount of indirect costs in an accounting period is less than the actual amount. **Overallocated indirect costs** occur when the allocated amount of indirect costs in an accounting period is greater than the actual amount.

$$\text{Underallocated (overallocated) indirect costs} = \text{Actual indirect costs incurred} - \text{Indirect costs allocated}$$

Consider the manufacturing overhead indirect cost pool at Robinson Company. There are two indirect cost accounts in the general ledger that have to do with manufacturing overhead:

1. Manufacturing Overhead Control, the record of the actual costs in all the individual overhead categories (such as indirect materials, indirect manufacturing labour, supervision, engineering, utilities, and plant depreciation).
2. Manufacturing Overhead Allocated, the record of the manufacturing overhead allocated to individual jobs on the basis of the budgeted rate multiplied by actual direct manufacturing labour-hours.

Assume the following annual data for the Robinson Company:

Manufacturing Overhead Control			Manufacturing Overhead Allocated		
Bal. Dec 31, 2012	1,215,000			Bal. Dec 31, 2012	1,080,000

The $1,080,000 credit balance in Manufacturing Overhead Allocated results from multiplying the 27,000 actual direct manufacturing labour-hours worked on all jobs in 2012 by the budgeted rate of $40 per direct manufacturing labour-hour.

The $135,000 difference (a net debit) is an underallocated amount because actual manufacturing overhead costs are greater than the allocated amount. This difference arises from two reasons related to the computation of the $40 budgeted hourly rate:

1. Numerator reason (indirect cost pool). Actual manufacturing overhead costs of $1,215,000 are greater than the budgeted amount of $1,120,000.
2. Denominator reason (quantity of allocation base). Actual direct manufacturing labour-hours of 27,000 are fewer than the budgeted 28,000 hours.

There are three main approaches to account for the $135,000 underallocated manufacturing overhead amount: (1) adjusted allocation-rate approach, (2) proration approach, and (3) write-off to cost of goods sold approach.

ADJUSTED ALLOCATION-RATE APPROACH

The **adjusted allocation-rate approach** restates all overhead entries in the general ledger and subsidiary ledgers using actual cost rates rather than budgeted cost rates. First, the actual manufacturing overhead rate is computed at the end of the fiscal year. Then, the manufacturing overhead costs allocated to every job during the year are recomputed using the actual manufacturing overhead rate (rather than the budgeted manufacturing overhead rate). Finally, end-of-year closing entries are made. The result is that at year-end, every job-cost record and finished goods record—as well as the ending Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold accounts—represent actual manufacturing overhead costs incurred.

The widespread adoption of computerized accounting systems has greatly reduced the cost of using the adjusted allocation-rate approach. Consider the Robinson example. The actual manufacturing overhead ($1,215,000) exceeds the manufacturing overhead allocated ($1,080,000) by 12.5% [($1,215,000 – $1,080,000) ÷ $1,080,000]. At year-end, Robinson could increase the manufacturing overhead allocated to each job in 2012 by 12.5% using a single software command. The command would adjust both the subsidiary ledgers and the general ledger.

Consider the British Columbia Pulp and Paper machine job, BCPP. Under normal costing, the manufacturing overhead allocated to the job is $3,520 (the budgeted rate of $40 per direct manufacturing labour-hour × 88 hours). Increasing the manufacturing overhead allocated by 12.5%, or $440 ($3,520 × 0.125), means the adjusted amount of manufacturing overhead allocated to Job BCPP equals $3,960 ($3,520 + $440). Note from page 117 that, using actual costing, manufacturing overhead allocated to this job is also $3,960 (the actual rate of $45 per direct manufacturing labour-hour × 88 hours). Making this adjustment under normal costing for each job in the subsidiary ledgers ensures that all $1,215,000 of manufacturing overhead is allocated to jobs.

The adjusted allocation-rate approach yields the benefits of both the *timeliness and convenience of normal costing during the year and the allocation of actual manufacturing overhead costs at year-end.* Each individual job-cost record and the end-of-year account balances for inventories and cost of goods sold are adjusted to actual costs. After-the-fact analysis of actual profitability of individual jobs provides managers with accurate and useful insights for future decisions about job pricing, which jobs to emphasize, and ways to manage job costs.

PRORATION APPROACH

Proration spreads underallocated overhead or overallocated overhead among ending work-in-process inventory, finished goods inventory, and cost of goods sold. Materials

inventory is not included in this proration because no manufacturing overhead costs have been allocated to it. In our Robinson example, end-of-year proration is made to the ending balances in Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold. Assume the following actual results for Robinson Company in 2012:

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	A	B	C
1	Account	Account Balance (Before Proration)	Allocated Manufacturing Overhead Included in Each Account Balance (Before Proration)
2	Work-in-process control	$ 50,000	$ 16,200
3	Finished goods control	75,000	31,320
4	Cost of goods sold	2,375,000	1,032,480
5		$2,500,000	$1,080,000

Robinson prorates the underallocated amount of $135,000 at the end of 2012. The proration method is done on the basis of the total amount of manufacturing overhead allocated in 2012 (before proration) in the ending balances of Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold. The $135,000 underallocated overhead is prorated over the three affected accounts in proportion to their total amount of manufacturing overhead allocated (before proration) in column 2 of the following table, resulting in the ending balances (after proration) in column 5 at actual costs.

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	A	B	C	D	E	F	G
10		Account Balance (Before Proration)	Allocated Manufacturing Overhead Included in Each Account Balance (Before Proration)	Allocated Manufacturing Overhead Included in Each Account Balance as a Percent of Total	Proration of $135,000 of Underallocated Manufacturing Overhead		Account Balance (After Proration)
11	Account	(1)	(2)	(3) = (2) / $1,080,000	(4) = (3) x $135,000		(5) = (1) + (4)
12	Work-in-process control	$ 50,000	$ 16,200	1.5%	0.015 x $135,000 =	$ 2,025	$ 52,025
13	Finished goods control	75,000	31,320	2.9%	0.029 x 135,000 =	3,915	78,915
14	Cost of goods sold	2,375,000	1,032,480	95.6%	0.956 x 135,000 =	129,060	2,504,060
15	Total	$2,500,000	$1,080,000	100.0%		$135,000	$2,635,000

Prorating on the basis of the manufacturing overhead allocated (before proration) results in allocating manufacturing overhead based on actual manufacturing overhead costs. Recall that the actual manufacturing overhead ($1,215,000) in 2012 exceeds the manufacturing overhead allocated ($1,080,000) in 2012 by 12.5%. The proration amounts in column 4 can also be derived by multiplying the balances in column 2 by 0.125. For example, the $3,915 proration to Finished Goods is 0.125 × $31,320. Adding these amounts effectively means allocating manufacturing overhead at 112.5% of what had been allocated before. The journal entry to record this proration is:

Work-in-Process Control	2,025	
Finished Goods Control	3,915	
Cost of Goods Sold	129,060	
Manufacturing Overhead Allocated	1,080,000	
Manufacturing Overhead Control		1,215,000

If manufacturing overhead had been overallocated, the Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold accounts would be decreased (credited) instead of increased (debited).

This journal entry closes (brings to zero) the manufacturing overhead-related accounts and restates the 2012 ending balances for Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold to what they would have been if actual manufacturing overhead rates had been used rather than budgeted manufacturing overhead rates. This method reports the same 2012 ending balances in the general ledger as the adjusted allocation-rate approach.

WRITE-OFF TO COST OF GOODS SOLD APPROACH

Under this approach, the total under- or overallocated manufacturing overhead is included in this year's Cost of Goods Sold. For Robinson, the journal entry would be:

Cost of Goods Sold	135,000	
Manufacturing Overhead Allocated	1,080,000	
Manufacturing Overhead Control		1,215,000

Robinson's two Manufacturing Overhead accounts are closed with the difference between them included in cost of goods sold. The Cost of Goods Sold account after the write-off equals $2,510,000, the balance before the write-off of $2,375,000 *plus the underallocated manufacturing overhead amount* of $135,000.

CHOICE AMONG APPROACHES

The write-off to Cost of Goods Sold is the simplest approach for dealing with under- or overallocated overhead. If the amount of under- or overallocated overhead is insignificant relative to total operating income or some other measure of materiality, then a write-off yields a good approximation to the more complex approaches. Managers must be guided by cost/benefit. Companies have become more stringent in inventory control and work to minimize inventory quantities. As a result, cost of goods sold tends to be higher in relation to the dollar amount of work-in-process and finished goods inventories. Also, the inventory balances of job-costing companies are usually small because goods are often made in response to customer orders. Consequently, writing off, instead of prorating, under- or overallocated overhead will usually not cause a material misstatement in the financial statements.

Regardless of which of the three approaches is used, the underallocated overhead is not carried in the overhead accounts beyond the end of the fiscal year. The reason is that ending balances in Manufacturing Overhead Control and Manufacturing Overhead Allocated are closed to zero when transferred to Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold at year-end.

PULLING IT ALL TOGETHER—PROBLEM FOR SELF-STUDY

(Try to solve this problem before examining the solution that follows.)

PROBLEM

You are asked to bring the following incomplete accounts of Endeavour Printing, Inc., up to date through January 31, 2013. Consider the data that appear in the T-accounts as well as the following information in items (a) through (j).

Endeavour's normal costing system has two direct cost categories (direct material costs and direct manufacturing labour costs) and one indirect cost pool (manufacturing overhead costs, which are allocated using direct manufacturing labour costs).

Materials Control	
12-31-2012 Bal. 15,000	

Wages Payable Control	
	1-31-2013 Bal. 3,000

Work-in-Process Control	

Manufacturing Overhead Control	
1-31-2013 Bal. 57,000	

Finished Goods Control	
12-31-2012 Bal. 20,000	

Costs of Goods Sold	

Additional Information

a. Manufacturing overhead is allocated using a budgeted rate that is set every December. Management forecasts next year's manufacturing overhead costs and next year's direct manufacturing labour costs. The budget for 2013 is $600,000 for manufacturing overhead costs and $400,000 for direct manufacturing labour costs.
b. The only job unfinished on January 31, 2013, is No. 419, on which direct manufacturing labour costs are $2,000 (125 direct manufacturing labour-hours) and direct material costs are $8,000.
c. Total direct materials issued to production during January 2013 are $90,000.
d. Cost of goods completed during January is $180,000.
e. Materials inventory as of January 31, 2013, is $20,000.
f. Finished goods inventory as of January 31, 2013, is $15,000.
g. All plant workers earn the same wage rate. Direct manufacturing labour-hours used for January total 2,500 hours. Other labour costs total $10,000.
h. The gross plant payroll paid in January equals $52,000. Ignore withholdings.
i. All "actual" manufacturing overhead incurred during January has already been posted.
j. All materials are direct materials.

Required

Calculate the following:

1. Materials purchased during January.
2. Cost of Goods Sold during January.
3. Direct manufacturing labour costs incurred during January.
4. Manufacturing Overhead Allocated during January.
5. Balance, Wages Payable Control, December 31, 2012.
6. Balance, Work-in-Process Control, January 31, 2013.
7. Balance, Work-in-Process Control, December 31, 2012.
8. Manufacturing Overhead Underallocated or Overallocated for January 2013.

5

SOLUTION

Letters alongside entries and in T-accounts correspond to letters in the preceding additional information. Numbers alongside entries in T-accounts correspond to numbers in the requirements above. Amounts from the T-accounts are labelled "(T)."

1. From Materials Control T-account, Materials purchased: $90,000 (c) + $20,000 (e) − $15,000 (T) = $95,000

2. From Finished Goods Control T-account, Cost of Goods Sold: $20,000 (T) + $180,000 (d) − $15,000 (f) = $185,000

3. Direct manufacturing wage rate: $2,000 (b) ÷ 125 direct manufacturing labour-hours (b) = $16 per direct manufacturing labour-hour

Direct manufacturing labour costs: 2,500 direct manufacturing labour-hours (g) × $16 per hour = $40,000

4. Manufacturing overhead rate: $600,000 (a) ÷ $400,000 (a) = 150%

Manufacturing Overhead Allocated: 150% of $40,000 = 1.50 × $40,000 (see 3) = $60,000

5. From Wages Payable Control T-account, Wages Payable Control, December 31, 2012: $52,000 (h) + $3,000 (T) − $40,000 (see 3) − $10,000 (g) = $5,000

6. Work-in-Process Control, January 31, 2013: $8,000 (b) + $2,000 (b) + 150% of $2,000 (b) = $13,000 (This answer is used in item 7.)

7. From Work-in-Process Control T-account, Work-in-Process Control, December 31, 2012: $180,000 (d) + $13,000 (see 6) − $90,000 (c) − $40,000 (see 3) − $60,000 (see 4) = $3,000
8. Manufacturing overhead overallocated: $60,000 (see 4) − $57,000 (T) = $3,000.

Materials Control

December 31, 2012 Bal.	(given)	15,000			
	(1)	95,000*		(c)	90,000
January 31, 2013 Bal.	(e)	20,000			

Work-in-Process Control

December 31, 2012 Bal.	(7)	3,000		(d)	180,000
Direct materials	(c)	90,000			
Direct manufacturing labour	(b) (g) (3)	40,000			
Manufacturing overhead allocated	(3) (a) (4)	60,000			
January 31, 2013 Bal.	(b) (6)	13,000			

Finished Goods Control

December 31, 2012 Bal.	(given)	20,000		(2)	185,000
	(d)	180,000			
January 31, 2013 Bal.	(f)	15,000			

Wages Payable Control

	(h)	52,000	December 31, 2012 Bal.	(5)	5,000
				(g) (3)	40,000
				(g)	10,000
			January 31, 2013	(given)	3,000

Manufacturing Overhead Control

Total January charges	(given)	57,000			

Manufacturing Overhead Allocated

				(3) (a) (4)	60,000

Cost of Goods Sold

(d) (f) (2)	185,000				

*Can be computed only after all other postings in the account have been found.

SUMMARY POINTS

The following question-and-answer format summarizes the chapter's learning outcomes. Each point presents a key question, and the guidelines are the answer to that question.

LEARNING OUTCOMES	GUIDELINES
1. How do cost object, direct costs, indirect costs, cost pools, and cost allocation bases link to one another?	These concepts link together in a systematic way to produce a job-costing system. The cost object is a distinct job. All direct (prime) costs, both fixed and variable, comprise one or more cost pools. All indirect costs arise when all jobs use common inputs but in different amounts. All indirect fixed and variable costs comprise one or more indirect cost pools. The direct costs are assigned to each job by using source documents to trace the costs of inputs used directly to the job that used them. The indirect costs are assigned to jobs by using cost allocation.
2. How does the decision framework apply to service job costing?	Service industries are usually labour intensive. Managers begin by identifying the problem as how to rank order their service jobs from most to least profitable. They gather and analyze relevant information such as costs that differ from job to job because each job uses different amounts of inputs. This is the reason for a job-costing system. Knowing the actual total cost of jobs is the basis on which managers can improve predicted profitability by expanding the most profitable types of service jobs undertaken and monitor the profitability on a continuous basis.

3. How does the decision framework apply to product job costing?	Manufacturing industries are usually machine or capital intensive. The decision framework applies in the same way to product job costing as it does to service job costing. Many manufacturing processes are machine or capital intensive rather than labour intensive. This affects the identification of cost pools and cost allocation bases. The assignment of costs in a product job-costing system requires the same seven steps.
4. How do you distinguish actual, budgeted, and normal costing methods?	The difference among these three is in how the cost allocation rate is calculated and the quantity of the cost allocation base (actual or budgeted) used to assign the indirect cost to each distinct job.
5. When are transactions recorded in a job-costing system and what methods are available to adjust for over- and underallocation of indirect costs?	A job-costing system records the flow of inventoriable costs: (a) acquisition of all inputs, (b) their conversion into work-in-process, (c) their conversion into finished goods or services, and (d) the sale of finished goods or services. Year-end adjustments are made to over- or under-allocated support costs. The over- or underallocation is either prorated or if the difference is not significant, written off to cost of goods sold.

TERMS TO LEARN

This chapter and the Glossary at the end of the book contain definitions of the following important terms:

actual costing (p. 119)
actual indirect cost allocation rate (p. 111)
adjusted allocation-rate approach (p. 129)
cost allocation (p. 107)
cost allocation base (p. 107)
cost allocation rate (p. 108)
cost driver (p. 107)
cost pool (p. 107)
indirect cost allocation rate (p. 106)
job (p. 109)
job-cost record (p. 111)
job-cost sheet (p. 111)
job-costing system (p. 109)
labour intensive (p. 111)
labour-time record (p. 115)
manufacturing overhead allocated (p. 124)
manufacturing overhead applied (p. 124)
materials-requisition record (p. 115)
normal costing (p. 121)
opportunity cost (p. 112)
overallocated indirect costs (p. 128)
process-costing system (p. 109)
proration (p. 129)
source document (p. 111)
underallocated indirect costs (p. 128)

ASSIGNMENT MATERIAL

MyAccountingLab

Make the grade with MyAccountingLab: The questions, exercises, and problems marked in red can be found on MyAccountingLab at **www.myaccountinglab.com**. You can practise them as often as you want, and most feature step-by-step guided instructions to help you find the right answer. Exercises and problems with an Excel icon in the margin have an accompanying Excel template on MyAccountingLab.

SHORT-ANSWER QUESTIONS

4-1 How does a job-costing system differ from a process-costing system?
4-2 What is the benefit of creating more than one manufacturing overhead cost pool?
4-3 Why might an advertising agency use job costing for an advertising campaign by Pepsi, whereas a bank might use process costing to determine the cost of chequing account deposits?
4-4 Describe the seven steps in job costing.
4-5 What are the two major cost objects that managers focus on in companies using job costing?
4-6 Describe the three major source documents used in job-costing systems.
4-7 What is the main concern about source documents used to prepare job-cost records?

4-8 Give two reasons why most organizations use an annual period rather than a weekly or monthly period to compute budgeted indirect cost allocation rates.

4-9 How does actual costing differ from normal costing?

4-10 Describe two ways in which a house-construction company may use job-cost information.

4-11 Comment on the following statement: "In a normal costing system, the amounts in the Manufacturing Overhead Control account will always equal the amounts in the Manufacturing Overhead Allocated account."

4-12 Describe three different debit entries in the Work-in-Process Control general ledger T-account.

4-13 Describe three alternative ways to dispose of underallocated or overallocated indirect costs.

4-14 When might a company use budgeted costs rather than actual costs to compute direct labour rates?

4-15 Describe briefly why modern technology such as Electronic Data Interchange (EDI) is helpful to managers.

EXERCISES

4-16 Terminology. A number of terms are listed below:

source document	actual
cost tracing	cost allocation rate
proration	opportunity cost
cost pool	

REQUIRED

Select the terms from the above list to complete the following sentences.

1. _____ spreads underallocated overhead or overallocated overhead among ending work-in-process inventory, finished goods inventory, and cost of goods sold.
2. The benefits of using a(n) _____ cost system is that your costing information is very accurate.
3. The _____ is the result of dividing the indirect cost pool by the cost allocation base.
4. A _____ is an original record that supports journal entries in an accounting system.
5. A(n) _____ is the contribution to income lost or forgone by not using a limited resource in its next-best alternative use.
6. _____ is the assigning of direct costs to the chosen cost object.
7. A _____ is a grouping of individual cost items.

4-17 Job costing, process costing. In each of the following situations, determine whether job costing or process costing would be more appropriate. 1

a. A CA firm
b. An oil refinery
c. A custom furniture manufacturer
d. A tire manufacturer
e. A textbook publisher
f. A pharmaceutical company
g. An advertising agency
h. An apparel manufacturing factory
i. A flour mill
j. A paint manufacturer
k. A medical care facility
l. A landscaping company
m. A cola-drink-concentrate producer
n. A movie studio
o. A law firm
p. A commercial aircraft manufacturer
q. A management consulting firm
r. A breakfast cereal company
s. A catering service
t. A paper mill
u. An auto repair garage

4-18 Actual costing, normal costing, manufacturing overhead. Destin Products uses a job-costing system with two direct cost categories (direct materials and direct manufacturing labour) and one manufacturing overhead cost pool. Destin allocates manufacturing overhead costs using direct manufacturing labour costs. Destin provides the following information: 3 4 5

1. Budget is 85% of direct labour costs.

	Budget for Year 2013	Actuals for Year 2013
Direct manufacturing labour costs	$2,600,000	$2,540,000
Direct manufacturing overhead costs	$2,210,000	$2,311,400
Direct materials costs	$1,800,000	$1,740,000

REQUIRED

1. Compute the actual and budgeted manufacturing overhead rates for 2013.
2. During March, the cost record for Job 626 contained the following:

Direct materials used	$38,000
Direct manufacturing labour costs	$27,000

Compute the cost of Job 626 using (a) an actual costing system and (b) a normal costing system.

3. At the end of 2013, compute the underallocated or overallocated manufacturing overhead under Destin's normal costing system. Why is there no underallocated or overallocated overhead under Destin's actual costing system?
4. Comment briefly on the advantages and disadvantages of actual costing systems and normal costing systems.

2 4

1a. Direct cost rate, $58 per professional labour-hour; Indirect cost rate, $48 per professional labour-hour

EXCEL

4-19 Job costing; actual, normal, and variation of normal costing. Chirac & Partners is a Quebec-based public accounting partnership specializing in audit services. Its job-costing system has a single direct cost category (professional labour) and a single indirect cost pool (audit support, which contains all the costs in the Audit Support Department). Audit support costs are allocated to individual jobs using actual professional labour-hours. Chirac & Partners employs ten professionals who are involved in their auditing services.

Budgeted and actual amounts for 2013 are as follows:

Budget for 2013	
Professional labour compensation	$960,000
Audit support department costs	$720,000
Professional labour-hours billed to clients	16,000 hours
Actual results for 2013	
Audit support department costs	$744,000
Professional labour-hours billed to clients	15,500 hours
Actual professional labour cost rate	$58 per hour

REQUIRED

1. Identify the direct cost rate per professional labour-hour and the indirect cost rate per professional labour-hour for 2013 under (a) actual costing, (b) normal costing, and (c) variation of normal costing that uses budgeted rates for direct costs.
2. The audit of Pierre & Company done in 2013 was budgeted to take 110 hours of professional labour time. The actual professional labour time on the audit was 120 hours. Compute the 2013 job cost using (a) actual costing, (b) normal costing, and (c) variation of normal costing that uses budgeted rates for direct costs. Explain any differences in the job cost.

2 4

1a. Direct cost rate, $60 per professional labour-hour; Indirect cost rate, $109.09 per professional labour-hour

4-20 Job costing; actual, normal, and variation from normal costing. Thanatos & Hades (T&H) is a law firm that specializes in writing wills. Its job-costing system has one direct cost pool, professional labour, and a single indirect cost pool that includes all supporting costs of running the law office. The support costs are allocated to clients on the basis of professional labour-hours. In addition to the two senior partners at T&H, there are six associates who work directly with clients. Each of the eight lawyers is expected to work for approximately 2,500 hours per year.

Budgeted and actual costs for 2012 were:

Budgeted professional labour costs	$1,100,000
Budgeted support costs	$2,000,000
Actual professional labour costs	$1,320,000
Actual support costs	$2,400,000
Actual total professional hours	22,000 hours

REQUIRED

1. Compute the direct cost rate and the indirect cost rate per professional labour-hour under:
   a. Actual costing.
   b. Normal costing.
   c. Variation from normal costing that uses budgeted rates for direct costs.
2. The will for a rich tycoon, Ari Roos, was very complex and took four lawyers at the firm 1,000 hours each to prepare. What would be the cost of writing this will under each of the costing methods in requirement 1?

3 4 5

1a. $50 per direct labour-hour; b. $42 per direct labour-hour

4-21 Job costing, normal, and actual costing. Anderson Construction assembles residential homes. It uses a job-costing system with two direct cost categories (direct materials and direct labour) and one indirect cost pool (assembly support). The allocation base for assembly support costs is direct labour-hours. In December 2012, Anderson budgets 2013 assembly support costs to be $8,000,000 and 2013 direct labour-hours to be 160,000.

At the end of 2013, Anderson is comparing the costs of several jobs that were started and completed in 2013. Information for a couple of jobs follows.

Construction Period	Laguna Model February–June 2013	Mission Model May–October 2013
Direct materials	$106,450	$127,604
Direct labour	$ 36,276	$ 41,410
Direct labour-hours	900	1,010

Direct materials and direct labour are paid for on a contract basis. The costs of each are known when direct materials are used or direct labour-hours are worked. The 2013 actual assembly support costs were $6,888,000, while the actual direct labour-hours were 164,000.

REQUIRED

1. Compute the (a) budgeted and (b) actual indirect cost rate. Why do they differ?
2. What is the job cost of the Laguna Model and the Mission Model using (a) normal costing and (b) actual costing?
3. Why might Anderson Construction prefer normal costing over actual costing?

4 5

1. $31.25 per machine hour

4-22 Normal costing, manufacturing overhead. (J. Watson) Trenton Ltd. uses a normal job-costing system and applies manufacturing overhead to products on the basis of machine hours. At the beginning of 2012, the company controller budgeted annual overhead at $1,500,000. She also forecast that machine hours would total 48,000. Actual costs were as follows:

Direct material (DM) used	$ 340,000
Direct labour	$ 875,000
Manufacturing overhead (MOH)	$1,605,000

Actual machine hours worked during the year were 49,200. Trenton adjusts any underallocated or overallocated overhead to cost of goods sold. The company's records show that total sales for the year were $2,938,000 and cost of goods sold (before adjustment) equalled $2,260,000.

REQUIRED

1. Determine the company's budgeted overhead rate.
2. Determine the amount of underallocated or overallocated overhead for the year.
3. Compute the company's cost of goods sold.

3 4 5

1. Total MOH allocated to Job 494, $99,000

4-23 Job costing, accounting for manufacturing overhead, budgeted rates. Lynn Company uses a job-costing system at its Mississauga plant. The plant has a Machining Department and an Assembly Department. Its job-costing system has two direct cost categories (direct materials and direct manufacturing labour) and two manufacturing overhead cost pools (the Machining Department, allocated using actual machine hours (MH), and the Assembly Department, allocated using actual direct manufacturing labour cost). The 2013 budget for the plant is as follows:

	Machining Department	Assembly Department
Manufacturing overhead (MOH)	$1,800,000	$3,600,000
Direct manufacturing labour cost	$1,400,000	$2,000,000
Direct manufacturing labour-hours (DMLH)	100,000	200,000
Machine hours (MH)	50,000	200,000

The company uses a budgeted overhead rate for allocating overhead to production orders on a machine-hour basis in Machining and on a direct-manufacturing-labour-cost basis in Assembly.

REQUIRED

1. During February, the cost record for Job 494 contained the following:

	Machining Department	Assembly Department
Direct materials used	$45,000	$70,000
Direct manufacturing labour cost	$14,000	$15,000
Direct manufacturing labour-hours (DMLH)	1,000	1,500
Machine hours (MH)	2,000	1,000

   Compute the total manufacturing overhead costs of Job 494.
2. At the end of 2013, the actual manufacturing overhead costs were $2,100,000 in Machining and $3,700,000 in Assembly. Assume that 55,000 actual machine hours were used in Machining and that actual direct manufacturing labour costs in Assembly were $2,200,000. Compute the overallocated or underallocated manufacturing overhead for each department.

3 4 5

1. Unit cost, $64.81

4-24 Job costing, budgeted rates, unit costs. (J. Watson) Lytton Ltd. uses a normal job-costing system with two direct cost categories (direct materials and direct labour) and one indirect cost pool. It allocates manufacturing overhead to jobs using a predetermined overhead rate based on direct labour-hours. At the start of the year, the company estimated that manufacturing overhead would be $632,000, and direct labour-hours were estimated at 32,000 hours for the year. In November, Job #X905 was completed. Materials costs on the job totalled $13,200 and labour costs totalled $10,120 at $22 per hour. At the end of the year, it was determined that the company worked 34,100 direct labour-hours for the year and incurred $656,125 in actual manufacturing overhead costs.

REQUIRED

1. Job #X905 contained 500 units. Determine the unit cost that would appear on the job-cost sheet.
2. Assuming Lytton prices its products to achieve a 25% margin, what would be the selling price of Job X905?
3. Determine the underallocated or overallocated overhead for the year.

2

2a. Hansen operating income, $275.

4-25 Computing indirect cost rates, services. Mike Rotundo, the president of Tax Assist, is examining alternative ways to compute indirect cost rates. He collects the following information from the budget for 2013:

- Budgeted variable indirect costs: $12 per hour of professional labour time
- Budgeted fixed indirect costs: $60,000 per quarter

The budgeted billable professional labour-hours per quarter are:

January–March	24,000 hours
April–June	12,000 hours
July–September	4,800 hours
October–December	7,200 hours

Rotundo pays all tax professionals employed by Tax Assist on an hourly basis ($36 per hour, including all fringe benefits).

Tax Assist's job-costing system has a single direct cost category (professional labour at $36 per hour) and a single indirect cost pool (office support that is allocated using professional labour-hours).

Tax Assist charges clients $78 per professional labour-hour.

REQUIRED

1. Compute budgeted indirect cost rates per professional labour-hour using
   a. Quarterly budgeted billable hours as the denominator.
   b. Annual budgeted billable hours as the denominator.
2. Compute the operating income for the following four customers using
   a. Quarterly based indirect cost rates.
   b. An annual indirect cost rate.
      - Stan Hansen: 10 hours in February.
      - Lelani Kai: 6 hours in March and 4 hours in April.

- Ken Patera: 4 hours in June and 6 hours in August.
- Evelyn Stevens: 5 hours in January, 2 hours in September, and 3 hours in November.

3. Comment on your results in requirement 2.

3 5

1. Overallocation, $130

4-26 Job costing, journal entries. The University of Toronto Press is wholly owned by the university. It performs the bulk of its work for other university departments, which pay as though the Press were an outside business enterprise. The Press also publishes and maintains a stock of books for general sale. A job-costing system is used to cost each job. There are two direct cost categories (direct materials and direct manufacturing labour) and one indirect cost pool (manufacturing overhead, allocated based on direct labour costs).

The following data (in thousands) pertain to 2013:

Direct materials and supplies purchased on account	$ 800
Direct materials used	710
Indirect materials issued to various production departments	100
Direct manufacturing labour	1,300
Indirect manufacturing labour incurred by various departments	900
Amortization on building and manufacturing equipment	400
Miscellaneous manufacturing overhead* incurred by various departments (ordinarily would be detailed as repairs, photocopying, utilities, etc.)	550
Manufacturing overhead allocated at 160% of direct manufacturing labour costs	?
Cost of goods manufactured	4,120
Revenues	8,000
Cost of goods sold	4,020
Inventories, December 31, 2012:	
Materials control	100
Work-in-process control	60
Finished goods control	500

*The term *manufacturing overhead* is not used uniformly. Other terms that are often encountered in printing companies include *job overhead* and *shop overhead*.

REQUIRED

1. Prepare general journal entries to summarize 2013 transactions. As your final entry, dispose of the year-end overallocated or underallocated manufacturing overhead as a direct write-off to Cost of Goods Sold. Number your entries. Explanations for each entry may be omitted.
2. Show posted T-accounts for all inventories, Cost of Goods Sold, Manufacturing Overhead Control, and Manufacturing Overhead Allocated.

3 5

1. WIP ending balance, $17.40

4-27 Job costing, journal entries. Duchess Ltd. manufactures and installs kitchen cabinetry. It uses normal job costing with two direct cost categories (direct materials and direct manufacturing labour) and one indirect cost pool for manufacturing overhead (MOH), applied on the basis of machine hours (MH). At the beginning of the year, the company estimated that it would work 980,000 MH and had budgeted $73,500,000 for MOH. The following data (in $ millions) pertain to operations for the year 2013:

Materials control (beginning balance), December 31, 2012	$6.0
Work-in-process control (beginning balance), December 31, 2012	1.8
Finished goods control (beginning balance), December 31, 2012	7.2
Materials and supplies purchased on account	238
Direct materials used	194
Indirect materials (supplies) issued to various production departments	27
Direct manufacturing labour	123
Indirect manufacturing labour incurred by various departments	19
Amortization on plant and manufacturing equipment	21
Miscellaneous manufacturing overhead incurred (credit Various Liabilities; ordinarily would be detailed as repairs, utilities, etc.)	9
Manufacturing overhead allocated (972,000 actual MH)	?
Cost of goods manufactured	374.3
Revenues	512
Cost of goods sold	368.4

REQUIRED

1. Prepare general journal entries. Number your entries. Post to T-accounts. What is the ending balance of Work-in-Process Control?
2. Show the journal entry for disposing of overallocated or underallocated manufacturing overhead directly as a year-end write-off to Cost of Goods Sold. Post the entry to T-accounts.

3 5

1. $551,500

4-28 Job costing, unit cost, ending work-in-process. Coakwell Company worked on only two jobs during May. Information on the jobs is given below:

	Job A701	Job A702
Direct materials	$ 80,000	$ 92,000
Direct labour	287,000	219,000
Direct manufacturing labour-hours (DMLH)	20,500	14,600

At the beginning of the year, annual manufacturing overhead (MOH) was budgeted at $3,780,000 and Coakwell budgeted 35,000 DMLH per month. Job A701 was completed in May.

REQUIRED

1. Compute the total cost of Job A701.
2. Calculate per unit cost for Job A701 assuming it has 2,500 units.
3. Make this journal entry transferring Job A701 to Finished Goods.
4. Determine the ending balance in the Work-in-Process account.

3 5

1a. $25 per direct labour-hour

4-29 Job costing, various cost drivers. (J. Watson) Rochester Ltd. has budgeted $435,000 for manufacturing overhead for the upcoming year. It forecast that 72,500 machine hours will be used in the factory, and budgeted direct labour-hours were 17,400. The average direct labour rate is budgeted to be $20. Actual data for the year were:

Actual manufacturing overhead	$434,300
Actual machine hours	73,010
Actual direct labour wage rate	$ 19.60
Actual direct labour-hours worked	17,630

REQUIRED

1. Compute the budgeted manufacturing overhead rate under each of the following cost drivers:
   a. Direct labour-hours
   b. Direct labour cost
   c. Machine hours
2. Compute the amount of underallocated or overallocated manufacturing overhead under each of the cost drivers listed in requirement 1.

3 5

2. Overallocation, $16,000

4-30 Job costing, journal entries, T-accounts, source documents. Production Company produces gadgets for the coveted small appliance market. The following data reflect activity for the most recent year, 2012:

Costs incurred	
Purchases of direct materials (net) on account	$124,000
Direct manufacturing labour cost	80,000
Indirect labour	54,500
Amortization, factory equipment	30,000
Amortization, office equipment	7,000
Maintenance, factory equipment	20,000
Miscellaneous factory overhead	9,500
Rent, factory building	70,000
Advertising expense	90,000
Sales commissions	30,000

Beginning and ending inventories for the year were as follows:

	January 1, 2012	December 31, 2012
Direct materials	$9,000	$11,000
Work-in-process	6,000	21,000
Finished goods	69,000	24,000

Production Company uses a normal job-costing system and allocates overhead to work-in-process at a rate of $2.50 per direct manufacturing labour dollar. Indirect materials are insignificant, so there is no inventory account for indirect materials.

REQUIRED

1. Prepare journal entries to record the 2012 transactions including an entry to close out over-allocated or underallocated overhead to cost of goods sold. For each journal entry, indicate the source document that would be used to authorize each entry. Also note which subsidiary ledger, if any, should be referenced as backup for the entry.
2. Post the journal entries to T-accounts for all of the inventories, Cost of Goods Sold, Manufacturing Overhead Control, and Manufacturing Overhead Allocated accounts.

4-31 Accounting for manufacturing overhead. Consider the following selected cost data for KYM Inc. for 2013.

3 5

1. $22 per MH

Budgeted manufacturing overhead (MOH)	$4,180,000
Budgeted machine hours (MH)	190,000
Actual manufacturing overhead (MOH) ending balance	$4,230,000
Actual machine hours (MH)	192,000

KYM's job-costing system has a single manufacturing overhead cost pool (allocated using a budgeted rate based on actual MH). Any amount of underallocation or overallocation is immediately written off to cost of goods sold.

REQUIRED

1. Compute the budgeted manufacturing overhead (MOH) rate.
2. Journalize the allocation of manufacturing overhead (MOH).
3. Compute the amount of underallocation or overallocation of MOH. Is the amount significant? Journalize the disposition of this amount based on the ending balances in the relevant accounts.

4-32 Proration of overhead. The Ride-On-Water (ROW) Company produces a line of non-motorized boats. ROW uses a normal job-costing system and allocates manufacturing overhead costs using direct manufacturing labour cost. The following data are available for 2012:

3 5

1. 50% of direct manufacturing labour costs

Budgeted manufacturing overhead costs	$100,000
Budgeted direct manufacturing labour cost	$200,000
Actual manufacturing overhead costs	$106,000
Actual direct manufacturing labour cost	$220,000

Inventory balances on December 31, 2012 were:

Account	Ending Balance	2012 Direct Manufacturing Labour Cost in Ending Balance
Work-in-process	$ 50,000	$ 20,000
Finished goods	$240,000	$ 60,000
Cost of goods sold	$560,000	$140,000

REQUIRED

1. Calculate the budgeted manufacturing overhead rate.
2. Calculate the amount of underallocated or overallocated manufacturing overhead.
3. Calculate the ending balances in work-in-process, finished goods, and cost of goods sold if underallocated or overallocated overhead is:
   a. Written off to cost of goods sold
   b. Prorated based on ending balances (before proration) in each of the three accounts
   c. Prorated based on the overhead allocated in 2012 in the ending balances, before proration, in each of the three accounts.
4. Which disposition method do you prefer in requirement 3? Explain.

3 5

a. $653,000

4-33 Job costing, solving for unknowns. (J. Watson) Osprey Ltd. manufactures designer purses. During the year, it recorded direct materials used of $684,000. Total manufacturing costs of $1,482,000 were incurred during the year. Osprey uses one indirect cost pool for all overhead costs and allocates overhead at a rate of 60% of direct labour dollars.

	January 1	December 31
Direct materials inventories	$193,000	$162,000
Work-in-process inventories	204,000	107,000
Finished goods inventories	225,000	248,000

REQUIRED

Prepare a Schedule of Cost of Goods Manufactured and Sold for the year. You will need to solve for the following unknowns:

a. Direct materials purchased.

b. Direct labour costs.

c. Manufacturing overhead allocated.

d. Cost of goods manufactured.

e. Cost of goods sold.

PROBLEMS

1

1. Taylor operating margin, 2.5%

4-34 Job-costing procedures. Broadway Printers operates a printing press with a monthly capacity of 2,000 machine hours (MH). Broadway has two main customers, Taylor Corporation and Kelly Corporation. Data on each customer for January follow:

	Taylor Corporation	Kelly Corporation	Total
Revenues	$132,000	$88,000	$220,000
Variable costs	46,200	52,800	99,000
Fixed costs (allocated on the basis of revenues)	66,000	44,000	110,000
Total operating costs	112,200	96,800	209,000
Operating income (loss)	$ 19,800	$(8,800)	$ 11,000
Machine hours (MH) required	1,500 hours	500 hours	2,000 hours

Each of the following requirements refers only to the preceding data; there is *no connection* between the requirements.

REQUIRED

1. Fixed costs arise because equipment and other capacity have been purchased. What would the allocation of fixed costs and what would be the operating income and operating margin for each job if the fixed MOH cost allocation base were machine hours instead of revenue?
2. Should Broadway drop the Kelly Corporation business? If Broadway drops the Kelly Corporation business, its total fixed costs will decrease by 20%.
3. Kelly Corporation indicates that it wants Broadway to do an *additional* $88,000 worth of printing jobs during February. These jobs are identical to the existing business Broadway did for Kelly in January in terms of variable costs and machine hours required. Broadway anticipates that the business from Taylor Corporation in February will be the same as that in January. Broadway can choose to accept as much of the Taylor and Kelly business for February as it wants. Assume that total fixed costs for February will be the same as the fixed costs in January. What should Broadway do? What will Broadway's operating income be in February?

5

1. Underallocated, $35,000

4-35 Disposition of underallocated or overallocated overhead. (J. Watson) Princeton Manufacturing budgeted $325,000 and incurred $337,000 of overhead costs in the past year. During the year, it allocated $302,000 to its production. An extract from the company's financial records showed the following account balances:

Work-in-Process Inventory	$26,000
Finished Goods Inventory	$37,625
Cost of Goods Sold	$86,375

REQUIRED

1. Calculate the amount of underallocated or overallocated manufacturing overhead for the year.
2. Prepare the journal entry to dispose of this underallocated or overallocated overhead amount using
   a. Immediate write-off to Cost of Goods Sold.
   b. Proration based on ending balances (before proration) in Work-in-Process Inventory, Finished Goods Inventory, and Cost of Goods Sold.
3. Which method do you recommend for this company?

4-36 Job costing, law firm. Keating & Partners is a law firm specializing in labour relations and employee-related work. It employs 25 professionals (5 partners and 20 managers) who work directly with its clients. The average budgeted total compensation per professional for 2013 is $104,000. Each professional is budgeted to have 1,600 billable hours to clients in 2013. Keating is a highly respected firm, and all professionals work for clients to their maximum 1,600 billable hours available. All professional labour costs are included in a single direct cost category and are traced to jobs on a per-hour basis.

2 4

1. $65 per professional labour-hour

All costs of Keating & Partners other than professional labour costs are included in a single indirect cost pool (legal support) and are allocated to jobs using professional labour-hours as the allocation base. The budgeted level of indirect costs in 2013 is $2.2 million.

REQUIRED

1. Compute the 2013 budgeted professional labour-hour direct cost rate.
2. Compute the 2013 budgeted indirect cost rate per hour of professional labour.
3. Keating & Partners is considering bidding on two jobs:
   a. Litigation work for Richardson Inc. that requires 100 budgeted hours of professional labour.
   b. Labour contract work for Punch Inc. that requires 150 budgeted hours of professional labour.

Prepare a cost estimate for each job.

4-37 Job costing with two direct cost and two indirect cost categories, law firm (continuation of 4-36). Keating has just completed a review of its job-costing system. This review included a detailed analysis of how past jobs used the firm's resources and interviews with personnel about what factors drive the level of indirect costs. Management concluded that a system with two direct cost categories (professional partner labour and professional manager labour) and two indirect cost categories (general support and administration support) would yield more accurate job costs. Budgeted information for 2013 related to the two direct cost categories is as follows:

2 4

1a. $125 per hour
b. $50 per hour

	Professional Partner Labour	Professional Manager Labour
Number of professionals	5	20
Hours of billable time per professional	1,600 per year	1,600 per year
Total compensation (average per professional)	$200,000	$80,000

Budgeted information for 2013 relating to the two indirect cost categories is

	General Support	Administration Support
Total costs	$1,800,000	$400,000
Cost allocation base	Professional labour-hours	Partner labour-hours

REQUIRED

1. Compute the 2013 budgeted direct cost rates for (a) professional partners and (b) professional managers.
2. Compute the 2013 budgeted indirect cost rates for (a) general support and (b) administration support.

3. Compute the budgeted job costs for the Richardson and Punch jobs, given the following information:

	Richardson Inc.	Punch Inc.
Professional partners	60 hours	30 hours
Professional managers	40 hours	120 hours

4. Comment on the results in requirement 3. Why are the job costs different from those computed in Problem 4-36?

4

1. $2,875,000

4-38 Normal costing, overhead allocation, working backwards. Gaston Ltd. uses a normal job-costing system with two direct cost categories—direct materials and direct manufacturing labour—and one indirect cost category—manufacturing overhead. At the beginning of 2013, Gaston had $236,000 in work-in-process inventory. The company allocates manufacturing overhead at the rate of 180% of direct manufacturing labour costs. Total allocated manufacturing overhead for the year was $5,175,000. Manufacturing costs incurred for the year were $9,732,500 and the cost of goods manufactured for the year totalled $9,612,200.

REQUIRED

1. What was the total direct labour cost in 2013?
2. What was the total cost of direct materials used in 2013?
3. What was the dollar amount of work-in-process inventory on December 31, 2013?

2 4 5

2. Machining Department: Overallocation, $510,000; Assembly Department: Underallocation, $170,000

4-39 Disposition of overhead overallocation or underallocation, two indirect cost pools. Glavine Corporation manufactures precision equipment made to order for the semiconductor industry. Glavine uses two manufacturing overhead cost pools—one for the overhead costs incurred in its highly automated Machining Department and another for overhead costs incurred in its labour-based Assembly Department. Glavine uses a normal costing system. It allocates Machining Department overhead costs to jobs based on actual machine hours using a budgeted machine hour overhead rate. It allocates Assembly Department overhead costs to jobs based on actual direct manufacturing labour-hours using a budgeted direct manufacturing labour-hour rate.

The following data are for the year 2013:

	Machining Department	Assembly Department
Budgeted overhead	$5,850,000	$7,812,000
Budgeted machine hours (MH)	90,000	0
Budgeted direct manufacturing labour-hours (DMLH)	0	124,000
Actual manufacturing overhead costs	$5,470,000	$8,234,000

Machine hours and direct manufacturing labour-hours and the ending balances (before proration of underallocated overhead) are as follows:

	Actual Machine Hours	Actual Direct Manufacturing Labour-Hours	Balance before Proration, December 31, 2013
Cost of Goods Sold	69,000	83,200	$21,600,000
Finished Goods	6,900	12,800	2,800,000
Work-in-Process	16,100	32,000	7,600,000

REQUIRED

1. Compute the budgeted overhead rates for the year in the Machining and Assembly Departments.
2. Compute the underallocated or overallocated overhead in *each* department for the year. Dispose of the underallocated or overallocated amount in *each* department using:
   a. Immediate write-off to Cost of Goods Sold.
   b. Proration based on ending balances (before proration) in Cost of Goods Sold, Finished Goods, and Work-in-Process.

c. Proration based on the allocated overhead amount (before proration) in the ending balances of Cost of Goods Sold, Finished Goods, and Work-in-Process.

3. Which disposition method do you prefer in requirement 2? Explain.

4-40 Job costing, normal versus actual under/over applied overhead. (J. Watson) The following information relates to the activities of King Ltd. for the year 2013:

3 4 5

1. Underallocated, $21,100

Advertising Costs	$ 62,500	Beginning Work-in-Process	$ 34,000
Direct Labour	320,000	Beginning Direct Materials	52,000
Indirect Labour	61,400	Factory Amortization	162,000
Factory Equipment Maintenance	13,300	Ending Work-in-Process	45,000
Ending Direct Materials	42,500	Factory Utilities	26,000
Office Amortization	13,000	Sales Commissions	24,000
Purchases of Direct Materials	156,000	Corporate Salaries	289,000
Factory Supplies	4,400	Insurance on Factory	22,600

The company uses normal costing and applies overhead on the basis of machine hours (MH). The company had calculated its overhead rate to be $4.25 per MH on the basis of 60,000 budgeted MH. Actual MH worked in the plant were 63,200.

REQUIRED

1. Compute the amount of overallocated or underallocated overhead for the year.
2. Prepare the journal entry to record the disposition of the amount of overallocated or underallocated overhead assuming the company writes off the difference to Cost of Goods Sold.
3. Identify and briefly outline an alternative treatment (from requirement 2) for disposing of overallocated or underallocated overhead.
4. Prepare a Schedule of Cost of Goods Manufactured for the year.
5. Briefly explain the differences between actual and normal costing, and state how the Schedule of Cost of Goods Manufactured would differ under actual costing.

4-41 Job costing and governance. Jack Halpern is the owner and CEO of Aerospace Comfort, a firm specializing in the manufacture of seats for air transport. He has just received a copy of a letter written to the Auditor General of the Canadian government. He believes it is from an ex-employee of Aerospace.

4

1. $820.30 per seat

Dear Sir,

Aerospace Comfort in 2013 manufactured 100 X7 seats for the Canadian Forces. You may be interested to know the following:

1. Direct materials cost billed for the 100 X7 seats was $40,000.
2. Direct manufacturing labour cost billed for 100 X7 seats was $8,400. This cost includes 16 hours of setup labour at $50 per hour, an amount included in the manufacturing overhead cost pool as well. The $8,400 also includes 15 hours of design time at $120 an hour. Design time was explicitly identified as a cost the Canadian Forces was not to reimburse.
3. Manufacturing overhead cost billed for 100 X7 seats was $14,700 (175% of direct manufacturing labour costs). This amount includes the 16 hours of setup labour at $50 per hour that is incorrectly included as part of direct manufacturing labour costs.

You may also want to know that over 40% of the direct materials is purchased from Frontier Technology, a company that is 51% owned by Jack Halpern's brother.

For obvious reasons, this letter will not be signed.

c.c.: *The Globe and Mail*
Jack Halpern, CEO of Aerospace Comfort

Aerospace Comfort's contract states that the Canadian Forces reimburses Aerospace at 130% of manufacturing costs.

REQUIRED

Assume that the facts in the letter are correct as you answer the following questions.

1. What is the cost amount per X7 seat that Aerospace Comfort billed the Canadian Forces? Assume that the actual direct materials costs are $40,000.
2. What is the amount per X7 seat that Aerospace Comfort should have billed the Canadian Forces? Assume that the actual direct materials costs are $40,000.
3. Based on the problems highlighted in the letter, what should the Canadian Forces do to tighten its procurement procedures to reduce the likelihood of such situations recurring?

5

2. Overallocation, $48,800

4-42 Allocation of manufacturing overhead and disposition of overallocation or underallocation. (SMA, heavily adapted) Nicole Limited is a company that produces machinery to customer order. Its job-costing system (using normal costing) has two direct cost categories (direct materials and direct manufacturing labour) and one indirect cost pool (manufacturing overhead, allocated using a budgeted rate based on direct manufacturing labour costs). The budget for 2013 was:

Direct manufacturing labour	$630,000
Manufacturing overhead	$441,000

At the end of 2013, two jobs were incomplete: No. 1768B (total direct manufacturing labour costs were $15,000) and No. 1819C (total direct manufacturing labour costs were $48,000). Machine time totalled 318 hours for No. 1768B and 654 hours for No. 1819C. Direct materials issued to No. 1768B amounted to $30,600. Direct materials for No. 1819C came to $56,800.

Total charges to the Manufacturing Overhead Control account for the year were $406,200. Direct manufacturing labour charges made to all jobs were $650,000, representing 25,000 direct manufacturing labour-hours (DMLH).

There were no beginning inventories. In addition to the ending work-in-process, the ending finished goods showed a balance of $204,500 (including a direct manufacturing labour cost component of $60,000). Sales for 2013 totalled $3,124,000, cost of goods sold was $2,200,000, and marketing costs were $523,900.

Nicole prices on a cost-plus basis. It currently uses a guideline of cost plus 40% of cost.

REQUIRED

1. Prepare a detailed schedule showing the ending balances in the inventories and cost of goods sold (before considering any underallocated or overallocated manufacturing overhead). Show also the manufacturing overhead allocated to these ending balances.
2. Compute the underallocated or overallocated manufacturing overhead for 2013.
3. Prorate the amount computed in requirement 2 on the basis of:
   a. The ending balances (before proration) of work-in-process, finished goods, and cost of goods sold.
   b. The allocated overhead amount (before proration) in the ending balances of work-in-process, finished goods, and cost of goods sold.
4. Assume that Nicole decides to immediately write off to Cost of Goods Sold any underallocated or overallocated manufacturing overhead. Will operating income be higher or lower than the operating income that would have resulted from the proration in requirements 3(a) and 3(b)?
5. Calculate the cost of job No. 1819C if Nicole Limited had used the adjusted allocation rate approach to disposing of underallocated or overallocated manufacturing overhead in 2013.

3 5

1. $403,000

4-43 General ledger relationships, underallocation and overallocation. (S. Sridhar, adapted) Northley Industries is a manufacturer of sailboats. The following partial information for 2013 is available:

Material Control

1-1-2013	32,000	403,000
	431,000	

Work-in-Process Control

1-1-2013	18,000	
Direct Manufacturing Labour		
	380,000	

Finished Goods Control

1-1-2013	12,250	1,280,000
	1,307,250	

Manufacturing Overhead Allocated

Manufacturing Overhead Control

	543,000

Cost of Goods Sold

Additional Information

1. Direct manufacturing labour wage rate was $16 per hour.
2. Manufacturing overhead (MOH) is allocated at $25 per direct manufacturing labour-hour (DMLH).
3. During the year, sales revenues were $1,664,000, and marketing and distribution expenses were $199,700.

Required

1. What was the amount of direct materials issued to manufacturing during the year?
2. What was the amount of manufacturing overhead allocated to jobs during the year?
3. What was the cost of jobs completed during the year?
4. What was the balance in work-in-process inventory on December 31, 2013?
5. What was the cost of goods sold before any proration of underallocated or overallocated overhead?
6. What was the underallocated or overallocated manufacturing overhead for the year?
7. Dispose of the underallocated or overallocated manufacturing overhead using:
   a. Immediate write-off to Cost of Goods Sold.
   b. Proration based on ending balances (before proration) in Work-in-Process, Finished Goods, and Cost of Goods Sold.
8. Using each of the disposition methods in requirement 7, calculate operating income for the year.
9. Which disposition method in requirement 7 do you recommend Northley use? Explain your answer briefly.

4-44 Normal costing, departments. (J. Watson) Kalor Ltd. uses a normal job-costing system with two direct cost categories, direct materials and direct labour, and one indirect cost pool. Manufacturing overhead is allocated based on direct labour costs. Any overallocated or underallocated overhead is written off to Cost of Goods Sold. Each product goes through two departments, Fabrication and Assembly. The Fabrication process is automated whereas the Assembly Department is highly labour intensive. Kalor's budget for 2013 was as follows:

3 4

1. $17,829,625

Budgeted	Fabrication	Assembly
Direct Materials (DM)	$3,500,000	$2,100,000
Direct Labour	$ 735,000	$3,825,000
Factory Overhead	$6,450,000	$1,530,000
Machine Hours (MH)	2,580,000	250,000

Kalor started the year without any work-in-process. During the year it had the following results:

Actual	Fabrication	Assembly
Direct Materials (DM)	$3,350,000	$2,200,000
Direct Labour	$ 750,000	$3,750,000
Factory Overhead	$6,390,000	$1,590,000
Machine Hours (MH)	2,610,000	260,000

At December 31, 2013, the company had only two jobs still in process, #Z438 and #Q917. Job #Z438 had $7,000 of direct materials and $1,500 of direct labour and had used 3,400 MH in fabrication. It had not yet been transferred to the Assembly Department. Job #Q917 had incurred $4,000 and $6,000 of direct materials costs in Fabrication and Assembly, respectively. It had used 1,800 MH in Fabrication and 800 MH in Assembly. Labour charges in the two departments were $9,000 and $18,000 for Fabrication and Assembly, respectively.

Required

1. Calculate Cost of Goods Manufactured for the year ended December 31, 2013, assuming the company uses its current overhead costing method.
2. Under the current costing system, what is the amount of overallocated or underallocated overhead?
3. What would be the amount of overallocated or underallocated overhead at the end of the year if the company had used departmental overhead rates with the most appropriate base for each department?

3 4 5

1. $60 per machine hour

4-45 Disposition of underallocated or overallocated overhead—Advanced. (Z. Iqbal, adapted) Naf Radiator Company uses a normal costing system with a single manufacturing overhead (MOH) cost pool and machine hours (MH) as the cost allocation base. The following data are for 2013:

Budgeted manufacturing overhead (MOH)	$4,800,000
Overhead allocation base	machine hours (MH)
Budgeted machine hours (MH)	80,000
Manufacturing overhead (MOH) incurred	$4,900,000
Actual machine hours (MH)	75,000

Machine-hours data and the ending balances (before proration of underallocated or overallocated overhead) are as follows:

	Actual Machine Hours (MH)	2013 End-of-Year Balance
Cost of Goods Sold	60,000	$8,000,000
Finished Goods Control	11,000	1,250,000
Work-in-Process Control	4,000	750,000

REQUIRED

1. Compute the budgeted manufacturing overhead rate for 2013.
2. Compute the underallocated or overallocated manufacturing overhead of Naf Radiator in 2013. Dispose of this underallocated or overallocated amount using:
   a. Write-off to Cost of Goods Sold.
   b. Proration based on ending balances (before proration) in Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold.
   c. Proration based on the allocated overhead amount (before proration) in the ending balances of Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold.
3. Which method do you prefer in requirement 2? Explain.

COLLABORATIVE LEARNING CASES

2 4

1. $12 per direct labour-hour

4-46 Normal job costing, unit costs. (J. Watson) Pearson Ltd. uses a normal job-costing system and applies overhead on the basis of direct labour-hours. At the beginning of the year, the company estimated that total overhead costs for the year would be $180,000, and it budgeted total labour-hours of 15,000. Actual labour-hours worked for the period January 1 to November 30 were 13,750.

On December 1, the company had three jobs in process:

Work-in-Process at December 1

Job Number	815	817	822
Direct Materials (DM)	$1,400	$2,500	$1,700
Direct Labour (DL)	$1,200	$2,400	$ 600
Overhead (OH)	$ 600	$1,350	$ 450
Total	$3,200	$6,250	$2,750

During the month of December the following costs were incurred by job:

Job #	815	817	822	823	824
DM	$500	$ 700	$1,300	$1,250	$1,500
DL	$900	$1,440	$3,060	$3,960	$5,940
DL hours	50 hours	80 hours	170 hours	220 hours	330 hours

In addition, the company incurred the following costs during the month of December (these costs have not yet been recorded in the books):

DM purchases	$7,800	Advertising expense	$5,200
Plant amortization	2,490	Factory repairs and maintenance	1,500
Factory utilities	1,800	Factory supplies	1,800
Production supervisor salary	2,200	Sales personnel salaries	9,700
Administrative salaries	3,450	Interest expense	1,400

Additional Information

1. The balance in the Overhead Control account on December 1 was $195,010.
2. There were no jobs in Finished Goods as of December 1.
3. Jobs # 815, 822, 823, and 824 were completed during December.
4. Job 824 is the only job in Finished Goods as of December 31.
5. The company's pricing policy is 200% of total manufacturing cost.

Required

1. Calculate the budgeted overhead rate used by Pearson.
2. Calculate the unit cost of ending work-in-process inventory assuming that the number of units in the job(s) total 250 units.
3. Calculate the cost of goods manufactured and the unadjusted gross margin for the month of December.
4. Calculate the amount of overallocated or underallocated overhead for the year.

2 4

1. $2,100

4-47 Job costing, service industry. Michael Scott books tours for new bands, and arranges to print T-shirts and produce demo CDs to sell on the tour. Scott's agency uses a normal costing system with two direct cost pools, labour and materials, and one indirect cost pool, general overhead. General overhead is allocated to each tour at 150% of labour cost. The following information relates to the agency for 2013:

1. As of June 1, there were tours in progress for two bands: Grunge Express and Different Strokes.
2. During June, both bands finished their tours.
3. New tours were started for three bands, As I Lay Dying, Ask Me Later, and Maybe Tomorrow. Of these bands, only Maybe Tomorrow finished its tour by the end of June.

All costs incurred during the planning stage for a tour are gathered in a balance sheet account called "Tours In Process (TIP)". When a tour is completed, the costs are transferred to an income statement account called "Cost of Completed Tours (CCT)."

The following cost information is for June:

	From Beginning TIP		Incurred in June	
	Materials	Labour	Materials	Labour
Grunge Express	$400	$600	$ 0	$100
Different Strokes	$300	$400	$175	$300
As I Lay Dying	$ 0	$ 0	$250	$400
Ask Me Later	$ 0	$ 0	$350	$200
Maybe Tomorrow	$ 0	$ 0	$275	$400

Actual overhead in June was $2,500.

Required

1. Calculate the TIP for the end of June.
2. Calculate CCT for June.
3. Calculate underallocated or overallocated overhead at the end of June.
4. Calculate the ending balances in work-in-process and cost of goods sold if the underallocated or overallocated overhead amount is:
   a. Written off to CCT.
   b. Prorated using the ending balances (before proration) in TIP and CCT.
   c. Prorated based on the overhead allocated in June in the ending balances of TIP and CCT (before proration).
5. Which of the methods in requirement 4 would you choose? Explain.