

## FIFO Method of Process Costing

In this supplement to *Managerial Accounting* we will illustrate the first-in, first-out (FIFO) method of process costing using the data for MVP Sports Equipment Company, which was given in Exhibit 4–4 in Chapter 4 of the text. Unlike the weighted-average method, the FIFO method does not commingle costs from two or more accounting periods. As the illustration will show, the costs from each period are treated separately.

**Step 1: Analysis of Physical Flow of Units** The *physical* flow of units is unaffected by the process-costing method used. Therefore, step 1 is identical under the weighted-average and FIFO methods. See Exhibit 4–5 in the text.

**Step 2: Calculation of Equivalent Units** A table of equivalent units, under FIFO process costing, is presented in Exhibit 4–A.\* It is identical to the table prepared under the weighted-average method except for one important difference. Under the FIFO method, the equivalent units of direct material and conversion represented by the March 1 work-in-process inventory are subtracted in the last row of the table. By subtracting the equivalent units in the beginning work in process, we are able to determine the *new equivalent units of activity accomplished in March only*. The 20,000 physical units in the March 1 work in process have all of their materials, so they represent 20,000 equivalent units of direct material. However, these units are only 10 percent complete with respect to conversion, so they represent only 2,000 equivalent units of conversion activity (20,000 physical units × 10% complete).

**Step 3: Computation of Unit Costs** The calculation of unit costs is presented in Exhibit 4–B. The cost per equivalent unit for direct material is computed by dividing the direct-material cost incurred *during March only* by the new equivalent units of direct material added *during March only*. An analogous procedure is used for conversion costs. Note that the costs for direct material and conversion assigned to the beginning inventory are *not* added to the costs incurred during March for the purpose of calculating unit costs.

**Step 4: Analysis of Total Costs** To complete the process-costing procedure, we determine the total cost to be transferred out of the Cutting Department’s Work-in-Process Inventory account and into the Stitching Department’s Work-in-Process

	Physical Units	Percentage of Completion with Respect to Conversion	Equivalent Units	
			Direct Material	Conversion
Work in process, March 1 . . . . .	20,000	10%		
Units started during March . . . . .	30,000			
Total units to account for . . . . .	<u>50,000</u>			
Units completed and transferred out during March . . . . .	40,000	100%	40,000	40,000
Work in process, March 31 . . . . .	10,000	50%	10,000	5,000
Total units accounted for . . . . .	<u>50,000</u>			
Total equivalent units . . . . .			50,000	45,000
Less: equivalent units represented in March 1 work in process . . . . .			<u>20,000</u>	<u>2,000</u>
New equivalent units accomplished in March only . . . . .			<u>30,000</u>	<u>43,000</u>

**Exhibit 4–A**  
Step 2: Calculation of Equivalent Units—Cutting Department (FIFO method)

\*Numerically designated exhibits are in Chapter 4 of the text (e.g., Exhibit 4–4). Alphanumerically designated exhibits are in this supplement (e.g., Exhibit 4–A).

**Exhibit 4-B**

Step 3: Computation of Unit Costs—Cutting Department (FIFO method)

	Direct Material	Conversion	Total
Work in process, March 1 (from Exhibit 4-4) . . . . .	These costs were incurred during February. They are not included in the unit-cost calculation for March.		\$ 57,200
Costs incurred during March (from Exhibit 4-4) . . .	\$90,000	\$193,500	283,500
Total costs to account for . . . . .			<u>\$340,700</u>
Equivalent units for March only (from step 2, Exhibit 4-A) . . . . .	30,000	43,000	
Costs per equivalent unit . . . . .	\$ 3.00	\$ 4.50	\$ 7.50
	↑	↑	↑
	<u>\$90,000</u>	<u>\$193,500</u>	<u>\$3.00 + \$4.50</u>
	30,000	43,000	

Inventory account. Exhibit 4-C presents this analysis of total costs. The calculations from step 3 are repeated in Exhibit 4-C for convenient reference.

Calculating the cost of goods completed and transferred out is more complicated under the FIFO method than under the weighted-average method. FIFO (first-in, first-out) implies that the units in the March 1 work-in-process inventory are completed and transferred out first. Under the FIFO method, the costs assigned to the March 1 work in process are not mingled with those incurred during March. Instead, these costs are kept separate and transferred out first. The units in the March 1 work in process need to be completed during March. Since 90 percent of the conversion remains to be done, 18,000 equivalent units of conversion is applied during March to the March 1 work in process. These equivalent units of conversion cost \$4.50 per unit since they are accomplished during March. The remainder of the 40,000 units completed and transferred out during March had to be *started and completed* during March. Thus, the remaining 20,000 units (40,000 units completed minus 20,000 units in the beginning work in process) cost \$7.50 each during March.

The calculations in Exhibit 4-C are used as the basis for the following journal entry to transfer the cost of goods completed and transferred out to the Stitching Department.

Work-in-Process Inventory: Stitching Department . . . . .	288,200	
Work-in-Process Inventory: Cutting Department . . . . .		288,200

On March 31, the Cutting Department’s Work-in-Process Inventory account appears as follows:

Work-in-Process Inventory: Cutting Department			
March 1 balance	57,200		
March cost of direct material, direct labor, and applied manufacturing overhead	283,500	288,200	Cost of goods completed and transferred out of Cutting Department
March 31 balance	52,500		

The March 31 balance in the account agrees with that calculated in Exhibit 4-C. Note that the March 31 balance in the Cutting Department’s Work-in-Process Inventory account differs under the FIFO and weighted-average methods of process costing.

	Direct Material	Conversion	Total
Work in process, March 1 (from Exhibit 4-4) . . . . .	These costs were incurred during February. They are not included in the unit-cost calculation for March.		\$ 57,200
Costs incurred during March (from Exhibit 4-4) . . . . .	\$90,000	\$193,500	<u>283,500</u>
Total costs to account for . . . . .			<u>\$340,700</u>
Equivalent units for March only (from step 2, Exhibit 4-A) . . . . .	30,000	43,000	
Costs per equivalent unit . . . . .	\$ 3.00	\$ 4.50	\$ 7.50
	↑	↑	↑
	<u>\$90,000</u>	<u>\$193,500</u>	\$3.00 + \$4.50
	30,000	43,000	
Cost of goods completed and transferred out of the Cutting Department during March:			
Cost of March 1 work-in-process inventory, which is transferred out first . . . . .			\$ 57,200
Cost incurred to finish the March 1 work-in-process inventory:			
$\left( \begin{matrix} \text{Number} \\ \text{of units} \end{matrix} \right) \times \left( \begin{matrix} \text{Percentage of} \\ \text{conversion remaining} \end{matrix} \right) \times \left( \begin{matrix} \text{Cost per equivalent} \\ \text{unit of conversion} \end{matrix} \right)$ . . . . .	20,000	$\times .90 \times \$4.50$	. . . . . 81,000
Cost incurred to produce units that were both started and completed during March:			
$\left( \begin{matrix} \text{Number} \\ \text{of units} \end{matrix} \right) \times \left( \begin{matrix} \text{Total cost per} \\ \text{equivalent unit} \end{matrix} \right)$ . . . . .	20,000*	$\times \$7.50$	. . . . . <u>150,000</u>
Total cost of goods completed and transferred out . . . . .			<u>\$288,200</u>
Cost remaining in March 31 work-in-process inventory in the Cutting Department:			
Direct material:			
$\left( \begin{matrix} \text{Number of equivalent} \\ \text{units of direct material} \end{matrix} \right) \times \left( \begin{matrix} \text{Direct-material cost} \\ \text{per equivalent unit} \end{matrix} \right)$ . . . . .	10,000	$\times \$3.00$	. . . . . \$ 30,000
Conversion:			
$\left( \begin{matrix} \text{Number of equivalent} \\ \text{units of conversion} \end{matrix} \right) \times \left( \begin{matrix} \text{Conversion cost per} \\ \text{equivalent unit} \end{matrix} \right)$ . . . . .	5,000	$\times \$4.50$	. . . . . <u>22,500</u>
Total cost of March 31 work-in-process inventory . . . . .			<u>\$ 52,500</u>
*Units started and completed during March: 40,000 units completed and transferred out minus 20,000 units in the March 1 work-in-process inventory.			
Check:			
Cost of goods completed and transferred out . . . . .			\$288,200
Cost of March 31 work-in-process inventory . . . . .			<u>52,500</u>
Total costs accounted for . . . . .			<u>\$340,700</u>

**Exhibit 4-C**  
Step 4: Analysis of Total Costs—Cutting Department (FIFO method)

**Departmental Production Report** The tables presented in Exhibits 4-A and 4-C can now be combined to form a production report for the Cutting Department. This report, which is displayed in Exhibit 4-D, provides a convenient summary of the FIFO process-costing method.

**Comparison of Weighted-Average and FIFO Methods**

The graph presented in Exhibit 4-E highlights the differences between the weighted-average and FIFO methods of process costing. The graph is based on the same continuing illustration; the basic data are presented in Exhibit 4-4 of the text. The graph

**Exhibit 4-D**

Production Report—Cutting Department (FIFO method)

	Physical Units	Percentage of Completion with Respect to Conversion	Equivalent Units	
			Direct Material	Conversion
Work in process, March 1	20,000	10%		
Units started during March	30,000			
Total units to account for	<u>50,000</u>			
Units completed and transferred out during March	40,000	100%	40,000	40,000
Work in process, March 31	10,000	50%	10,000	5,000
Total units accounted for	<u>50,000</u>			
Total equivalent units			<u>50,000</u>	<u>45,000</u>
Less: equivalent units represented in March 1 work in process			<u>20,000</u>	<u>2,000</u>
New equivalent units accomplished in March only			<u>30,000</u>	<u>43,000</u>

	Direct Material	Conversion	Total
Work in process, March 1 (from Exhibit 4-4)			\$ 57,200
			These costs were incurred during February. They are not included in the unit-cost calculation for March.
Costs incurred during March (from Exhibit 4-4)	\$90,000	\$193,500	<u>283,500</u>
Total costs to account for			<u>\$340,700</u>
Equivalent units for March only (from step 2, Exhibit 4-A)	30,000	43,000	
Costs per equivalent unit	\$ 3.00	\$ 4.50	\$ 7.50
	↑	↑	↑
	<u>\$90,000</u>	<u>\$193,500</u>	<u>\$300 + \$450</u>
	30,000	43,000	

focuses on conversion activity, but an analogous graph could be prepared for direct material. Groups of physical units are graphed on the horizontal axis, and the percentage of conversion activity accomplished during March is graphed on the vertical axis. Area I represents the equivalent units of conversion accomplished *during February* on the March 1 work-in-process inventory. Area II represents the equivalent units of conversion required during March to complete the conversion of the beginning work-in-process inventory. Area III represents the equivalent units of conversion activity accomplished during March on the units that were *both started and completed during March*. Area IV represents the equivalent units of conversion activity accomplished during March on the March 31 work-in-process inventory.

The key difference between the weighted-average and FIFO methods lies in the treatment of area I. Under the weighted-average method, the conversion costs associated with areas I, II, III, and IV are divided by the total equivalent units of conversion activity represented by areas I, II, III, and IV. The resulting conversion cost per equivalent unit is a weighted average of some of the conversion costs incurred in February (area I) and the conversion costs incurred during March (areas II, III, and IV).

In contrast, under the FIFO method, the total conversion costs associated only with areas II, III, and IV are divided by the equivalent units of conversion activity represented by areas II, III, and IV. The resulting conversion cost per equivalent unit is a

**Exhibit 4-D**

(concluded)

Cost of goods completed and transferred out of the Cutting Department during March:	
Cost of March 1 work-in-process inventory, which is transferred out first . . . . .	\$ 57,200
Cost incurred to finish the March 1 work-in-process inventory:	
$\left( \text{Number of units} \right) \times \left( \text{Percentage of conversion remaining} \right) \times \left( \text{Cost per equivalent unit of conversion} \right)$ . . . . .	20,000 × .90 × \$4.50 . . . . . 81,000
Cost incurred to produce units that were both started and completed during March:	
$\left( \text{Number of units} \right) \times \left( \text{Total cost per equivalent unit} \right)$ . . . . .	20,000* × \$7.50 . . . . . <u>150,000</u>
Total cost of goods completed and transferred out . . . . .	<u>\$288,200</u>
Cost remaining in March 31 work-in-process inventory in the Cutting Department:	
Direct material:	
$\left( \text{Number of equivalent units of direct material} \right) \times \left( \text{Direct-material cost per equivalent unit} \right)$ . . . . .	10,000 × \$3.00 . . . . . \$ 30,000
Conversion:	
$\left( \text{Number of equivalent units of conversion} \right) \times \left( \text{Conversion cost per equivalent unit} \right)$ . . . . .	5,000 × \$4.50 . . . . . <u>22,500</u>
Total cost of March 31 work-in-process inventory . . . . .	<u>\$ 52,500</u>
*Units started and completed during March: 40,000 units completed and transferred out minus 20,000 units in the March 1 work-in-process inventory.	
Check: Cost of goods completed and transferred out . . . . .	\$288,200
Cost of March 31 work-in-process inventory . . . . .	<u>52,500</u>
Total costs accounted for . . . . .	<u>\$340,700</u>

pure March unit cost, because areas II, III, and IV represent conversion costs and activity of March only.

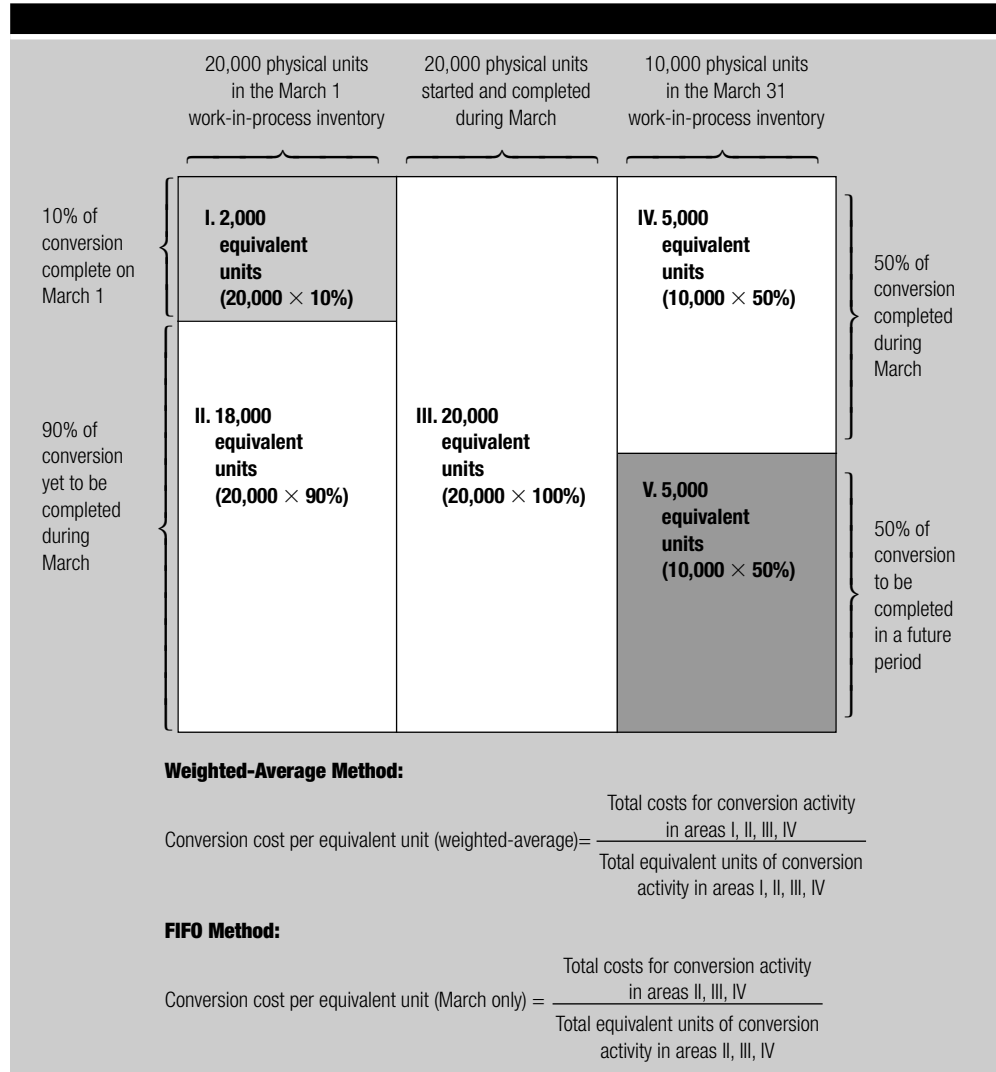
**Evaluation of Weighted-Average and FIFO** The weighted-average method of process costing is more widely used than the FIFO method, probably because it is somewhat simpler. Most product costing systems were designed before the wide use of computers, when the complexity of the system was an important consideration. Nowadays, most product costing systems are computerized; operating a process costing system is equally simple when using either the weighted-average method or the FIFO method.

**Behavioral Implications** For purposes of cost control and performance evaluation, FIFO process costing is superior to the weighted-average method. To provide incentives for departmental managers to control costs, it is important to evaluate their performance on the basis of current-period costs only. When current-period and prior-period costs are averaged, a departmental manager’s *current* performance is less clear. Moreover, performance evaluation based partially on costs incurred in prior periods is less timely. Behavioral scientists generally agree that for performance evaluation to be most effective, it should be done on a timely basis.

**Just-in-Time (JIT) Inventory Methods** The difference between weighted-average and FIFO process costing becomes much less significant when the firm uses the just-in-time approach to inventory and production management. Under the JIT philosophy, all inventories are kept to an absolute minimum, including work-in-process inventories. The difference that arises between weighted-average and FIFO process costing calculations is due to the different treatment of each period’s beginning work-in-process

**Exhibit 4-E**

## Comparison of Weighted-Average and FIFO Methods

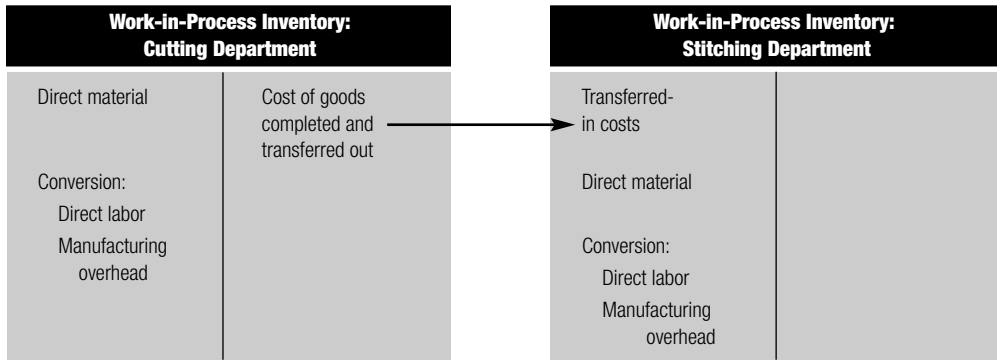


inventory under the two methods. (To see this most clearly, you may wish to review Exhibit 4–C.) Since work-in-process inventories are very small or nonexistent under JIT, there will be little or no difference in the process costing calculations under the weighted-average and FIFO methods.

## Sequential Production Departments

In manufacturing operations with sequential production departments, the costs assigned to the units transferred out of one department remain assigned to those units as they enter the next department. In our illustration, the partially completed baseball gloves transferred out of the Cutting Department go next to the Stitching Department. There the cut-out pieces are stitched together. Since the cost of the thread used in the stitching is very small, it is treated as an indirect-material cost and included in manufacturing overhead. At the end of the process in the Stitching Department, rawhide lacing is woven through the fingers and along some edges of each baseball glove. The rawhide lacing is treated as a direct material.

The cost of goods completed and transferred out of the Cutting Department is transferred as shown in the following display.



As the T-accounts show, the Cutting Department has two cost elements: direct-material and conversion costs. However, the Stitching Department has three cost elements: direct-material, conversion, and *transferred-in costs*. Transferred-in costs are the costs assigned to the units transferred from the Cutting Department to the Stitching Department. Transferred-in costs are conceptually similar to direct-material costs. The only difference is that direct-material costs relate to raw materials, whereas transferred-in costs relate to partially completed products.

Exhibit 4–F presents the basic data for our illustration of process costing in the Stitching Department. The March 1 work-in-process inventory in the department consists of 10,000 units that received some work in the Stitching Department during February but were not completed. The \$61,000 of transferred-in costs in the March 1 work-in-process inventory are costs that were transferred into the Stitching Department’s Work-in-Process Inventory account during February. Note that any partially completed baseball glove in the Stitching Department must have received all of its

<b>Work in process, March 1—10,000 units:</b>	
Transferred-in: 100% complete, cost of	\$ 61,000*
Direct material: none	—0—
Conversion: 20% complete, cost of	7,600*
Balance in work in process, March 1	<u>\$ 68,600*</u>
Units transferred in from Cutting Department during March	40,000 units
Units completed during March and transferred out to finished-goods inventory	30,000 units
Work in process, March 31	20,000 units
Transferred in: 100% complete	
Direct material: none	
Conversion: 90% complete	
Costs incurred during March:	
Transferred in from Cutting Department (assumes that the FIFO method was used for the Cutting Department)	<u>\$288,200</u>
Direct material	<u>\$ 7,500</u>
Conversion costs:	
Direct labor	\$115,000
Applied manufacturing overhead	115,000 <sup>†</sup>
Total conversion costs	<u>\$230,000</u>

\*These costs were incurred during the prior month, February.

<sup>†</sup>  $\left( \frac{\text{Predetermined overhead rate}}{\text{Direct-labor cost}} \right) \times \left( \frac{\text{Direct-labor cost}}{\text{Direct-labor cost}} \right) = 100\% \times \$115,000 = \$115,000$

**Exhibit 4–F**  
Basic Data for Illustration—  
Stitching Department

**Exhibit 4-G**

Production Report—Stitching Department (FIFO method)

	STEP 1		STEP 2		
	Physical Units	Percentage of Completion with Respect to Conversion	Equivalent Units		
			Transferred in	Direct Material	Conversion
Work in process, March 1 . . . . .	10,000	20%			
Units transferred in during March . . .	40,000				
Total units to account for . . . . .	<u>50,000</u>				
Units completed and transferred out during March . . . . .	30,000		30,000	30,000	30,000
Work in process, March 31 . . . . .	20,000	90%	20,000	—0—	18,000
Total units accounted for . . . . .	<u>50,000</u>				
Total equivalent units . . . . .			50,000	30,000	48,000
Less equivalent units represented in March 1 work in process . . . . .			10,000	—0—	2,000
New equivalent units accomplished in March only . . . . .			<u>40,000</u>	<u>30,000</u>	<u>46,000</u>

	Transferred in	Direct Material	Conversion	Total
Work in process, March 1 (from Exhibit 4-F) . . . . .				\$ 68,600
				These costs were incurred during February. They are not included in the unit-cost calculation for March.
Costs incurred during March (from Exhibit 4-F) . . . . .	\$288,200*	\$ 7,500	\$230,000	525,700
Total costs to account for . . . . .				<u>\$594,300</u>
Equivalent units for March only . . . . .	40,000	30,000	46,000	
Costs per equivalent unit . . . . .	\$ 7.205	\$ .25	\$ 5.00	\$ 12.455
	↑	↑	↑	↑
	<u>\$288,200</u>	<u>\$7,500</u>	<u>\$230,000</u>	<u>\$7.205</u>
	40,000	30,000	46,000	+\$ .25
				+\$5.00

\*Cost of goods completed and transferred out of Cutting Department during March, under the FIFO method (calculated in Exhibit 4-C).

transferred-in input, or it would not have been transferred from the Cutting Department. The March 1 work-in-process inventory has not yet received any direct material in the Stitching Department, because the direct material (rawhide lacing) is not added until the end of the process.

As Exhibit 4-F shows, 40,000 units were transferred into the Stitching Department during March. This agrees with Exhibit 4-4 in the text, which shows that 40,000 units were completed and transferred out of the Cutting Department during March. The Stitching Department completed 30,000 units during March and transferred them to finished-goods inventory. This left 20,000 units in the Stitching Department's March 31 work-in-process inventory.



**Exhibit 4-G**

(concluded)

STEP 4	
Cost of goods completed and transferred out of the Stitching Department during March:	
Cost of March 1 work-in-process inventory, which is transferred out first .....	\$ 68,600
Cost incurred to finish the March 1 work-in-process inventory:	
$\left( \begin{array}{c} \text{Number} \\ \text{of units} \end{array} \right) \times \left( \begin{array}{c} \text{Percentage of} \\ \text{direct material} \\ \text{remaining} \end{array} \right) \times \left( \begin{array}{c} \text{Cost per} \\ \text{equivalent unit} \\ \text{of material} \end{array} \right) \dots 10,000 \times 100\% \times \$0.25 \dots$	2,500
$\left( \begin{array}{c} \text{Number} \\ \text{of units} \end{array} \right) \times \left( \begin{array}{c} \text{Percentage of} \\ \text{conversion} \\ \text{remaining} \end{array} \right) \times \left( \begin{array}{c} \text{Cost per} \\ \text{equivalent unit} \\ \text{of conversion} \end{array} \right) \dots 10,000 \times 80\% \times \$5.00 \dots$	40,000
Cost incurred to produce units that were both started and completed during March:	
$\left( \begin{array}{c} \text{Number} \\ \text{of units} \end{array} \right) \times \left( \begin{array}{c} \text{Total cost per} \\ \text{equivalent} \\ \text{unit} \end{array} \right) \dots 20,000^\dagger \times \$12.455 \dots$	249,100
Total cost of goods completed and transferred out .....	<u>\$360,200</u>
Cost remaining in March 31 work-in-process inventory in the Stitching Department:	
Transferred-in costs:	
$\left( \begin{array}{c} \text{Number of equivalent} \\ \text{units of transferred-} \\ \text{in costs} \end{array} \right) \times \left( \begin{array}{c} \text{Transferred-in} \\ \text{cost per} \\ \text{equivalent unit} \end{array} \right) \dots 20,000 \times \$7.205 \dots$	\$144,100
Conversion:	
$\left( \begin{array}{c} \text{Number of equivalent} \\ \text{units of conversion} \end{array} \right) \times \left( \begin{array}{c} \text{Conversion cost} \\ \text{per equivalent} \\ \text{unit} \end{array} \right) \dots 18,000 \times \$5.00 \dots$	90,000
Total cost of March 31 work-in-process inventory .....	<u>\$234,100</u>
<sup>†</sup> Units started and completed during March: 30,000 units completed and transferred out minus 10,000 units in the March 1 work-in-process inventory.	
Check: Cost of goods completed and transferred out .....	\$360,200
Cost of March 31 work-in-process inventory .....	234,100
Total costs accounted for .....	<u>\$594,300</u>

Exhibit 4-F shows that the costs incurred in the Stitching Department during March were \$7,500 for direct material, \$115,000 for direct labor, and \$115,000 for *applied* manufacturing overhead. The predetermined overhead rate in the Stitching Department is 100 percent of direct-labor cost. Note that the predetermined overhead rates are different in the two production departments.

The March transferred-in cost in the Stitching Department is the cost of goods completed and transferred out of the Cutting Department. The amount of this cost depends on whether the weighted-average or FIFO process-costing method is used in the Cutting Department. The amount shown in Exhibit 4-F, \$288,200, assumes that the FIFO method was used in the Cutting Department. This amount comes from Exhibit 4-C.

Exhibit 4-G presents a production report for the Stitching Department using the FIFO process-costing method. Step 1 details the physical flow of units. In step 2, the calculation of equivalent units, the equivalent units in the March 1 work-in-process

inventory are subtracted to arrive at the new equivalent units of activity for March only. This is done for transferred-in activity, direct material, and conversion.

The costs per equivalent unit are computed in step 3. Under FIFO, the cost assigned to the March 1 work-in-process inventory is *not* added to the cost incurred during March. The March transferred-in cost is \$288,200. This is the cost of goods completed and transferred out of the Cutting Department, *computed using the FIFO method* (Exhibit 4–C).

An analysis of the total costs in the Stitching Department is presented in step 4 of Exhibit 4–G. Under the FIFO method, the cost assigned to the March 1 work-in-process inventory, \$68,600, is transferred out first. Note that the cost incurred to complete the March 1 work-in-process inventory includes the cost of direct material since direct material is not added in the Stitching Department until the end of the process. The cost of the 20,000 units started and completed in the Stitching Department during March is found by multiplying 20,000 by the total cost per equivalent unit computed in step 3, \$12.455. Finally, the cost remaining in the Stitching Department's Work-in-Process Inventory account on March 31 includes not only conversion costs but also transferred-in costs. The transferred-in cost per equivalent unit in March, under FIFO, is \$7.205 (see step 3). The following journal entry is made to transfer the cost of the units completed to the Finished-Goods Inventory account.

Finished-Goods Inventory . . . . .	360,200	
Work-in-Process Inventory: Stitching Department . . . . .		360,200
To transfer the cost of goods completed, as computed under the FIFO method.		

### Summary of Transferred-in Costs

When manufacturing is done in sequential production departments, the cost assigned to the units completed in each department is transferred to the next department's Work-in-Process Inventory account. This cost is termed *transferred-in cost*, and it is handled as a distinct cost element in the process-costing calculations. In this way, the final cost of the product is built up cumulatively as the product progresses through the production sequence.

## Review Questions

1. JIT inventory and production management systems are coming into widespread use. What are the implications of the JIT approach for process costing?
2. Explain how the computation of equivalent units differs between the weighted-average and FIFO methods.
3. How are the costs of the beginning work-in-process inventory treated differently under the weighted-average and FIFO methods?

## Exercises

### ■ Exercise 4 Physical Flow and Equivalent Units; FIFO

The Portsmouth plant of Health Foods Corporation produces low-fat salad dressing. The following data pertain to the year just ended.

	Units	Percentage of Completion	
		Direct Material	Conversion
Work in process, January 1 . . . . .	20,000 lb.	80%	60%
Work in process, December 31 . . . . .	15,000 lb.	70%	30%

During the year the company started 120,000 pounds of material in production.

**Required:**

Prepare a schedule analyzing the physical flow of units and computing the equivalent units of both direct material and conversion for the year. Use FIFO process costing.

Glass Creations, Inc. manufactures decorative glass products. The firm employs a process-costing system for its manufacturing operations. All direct materials are added at the beginning of the process, and conversion costs are incurred uniformly throughout the process. The company's production schedule for October follows.

	<b>Units</b>
Work in process on October 1 (60% complete as to conversion) .....	1,000
Units started during October .....	5,000
Total units to account for .....	<u>6,000</u>
Units from beginning work in process, which were completed and transferred out during October .....	1,000
Units started and completed during October .....	3,000
Work in process on October 31 (20% complete as to conversion) .....	<u>2,000</u>
Total units accounted for .....	<u>6,000</u>

■ **Exercise 5**  
Equivalent Units; FIFO

**Required:**

Calculate each of the following amounts using FIFO process costing.

1. Equivalent units of direct material during October.
2. Equivalent units of conversion activity during October.

(CMA, adapted)

Energy Resource Company refines a variety of petrochemical products. The following data are from the firm's Amarillo plant.

Work in process, November 1 .....	2,000,000 gallons
Direct material .....	100% complete
Conversion .....	25% complete
Units started in process during November .....	950,000 gallons
Work in process, November 30 .....	240,000 gallons
Direct material .....	100% complete
Conversion .....	80% complete

■ **Exercise 6**  
Equivalent Units; FIFO

**Required:**

Compute the equivalent units of direct material and conversion for the month of November. Use the FIFO method of process costing.

Vancouver Glass Company manufactures window glass for automobiles. The following data pertain to the Plate Glass Department.

Work in process, June 1:	
Direct material .....	\$ 37,000
Conversion .....	36,750
Costs incurred during June:	
Direct material .....	\$150,000
Conversion .....	230,000

■ **Exercise 7**  
Cost per Equivalent Unit;  
FIFO

The equivalent units of activity for June, under FIFO process costing, were as follows: 15,000 equivalent units of direct material, and 46,000 equivalent units of conversion activity.

**Required:**

Calculate the cost per equivalent unit, for both direct material and conversion, during June. Use FIFO process costing.

■ **Exercise 8**  
Cost per Equivalent Unit;  
FIFO

Montana Lumber Company grows, harvests, and processes timber for use in construction. The following data pertain to the firm's sawmill during November.

Work in process, November 1:	
Direct material .....	\$ 65,000
Conversion .....	180,000
Costs incurred during November:	
Direct material .....	\$425,000
Conversion .....	690,000

The equivalent units of activity for November, under FIFO process costing, were as follows: 4,250 equivalent units of direct material, and 1,000 equivalent units of conversion activity.

**Required:**

Calculate the cost per equivalent unit, for both direct material and conversion, during November. Use FIFO process costing.

■ **Exercise 9**  
Analysis of Total Costs; FIFO

Richmond Textiles Company manufactures a variety of natural fabrics for the clothing industry. The following data pertain to the Weaving Department for the month of September.

Equivalent units of direct material .....	40,000
Equivalent units of conversion .....	44,000
Units completed and transferred out during September .....	50,000

The cost data for September are as follows:

Work in process, September 1	
Direct material .....	\$ 94,000
Conversion .....	44,400
Costs incurred during September	
Direct material .....	\$164,000
Conversion .....	272,800

There were 20,000 units in process in the Weaving Department on September 1 (complete as to direct material, and 40% complete as to conversion).

**Required:**

Compute each of the following amounts using FIFO process costing.

1. Cost of goods completed and transferred out of the Weaving Department during September.
2. Cost of the September 30 work-in-process inventory in the Weaving Department. The equivalent units in the ending work in process are 10,000 for direct material and 2,000 for conversion.

■ **Exercise 10**  
Analysis of Total Costs; FIFO

The following data pertain to Birmingham Paperboard Company, a manufacturer of cardboard boxes.

Work in Process, February 1 .....	10,000 units*
Direct material .....	\$ 5,500
Conversion .....	17,000
Costs incurred during February	
Direct material .....	\$110,000
Conversion .....	171,600

\*Complete as to direct material; 40% complete as to conversion.

The equivalent units of activity for February were as follows:

Direct material (FIFO method) .....	100,000
Conversion (FIFO method) .....	88,000
Completed and transferred out .....	90,000

**Required:**

Compute each of the following amounts using FIFO process costing.

1. Cost of goods completed and transferred out during February.
2. Cost of the February 28 work-in-process inventory. The equivalent units in the ending work in process are 20,000 for direct material and 2,000 for conversion.

On January 1, the Molding Department of Camden Plastics Company had no work-in-process inventory due to the implementation of a just-in-time inventory system. On January 31, the following journal entry was made to record the cost of goods completed and transferred out of the Molding Department.

■ **Exercise 11**  
JIT; Weighted-Average versus FIFO; Journal Entry

Finished-Goods Inventory .....	\$176,000			
Work-in-Process Inventory: Molding Department .....			\$176,000	

The company uses weighted-average process costing.

**Required:**

What would the amount in the journal entry have been if Camden Plastics Company had used the FIFO method of process costing? Why?

## Problems

Moravia Company processes and packages cream cheese. The following data have been compiled for the month of April. Conversion activity occurs uniformly throughout the production process.

■ **Problem 12**  
Straightforward FIFO Process Costing; Step-by-Step Approach

Work in process, April 1—10,000 units:		
Direct material: 100% complete, cost of .....		\$ 22,000
Conversion: 20% complete, cost of .....		4,500
Balance in work in process, April 1 .....		<u>\$ 26,500</u>
Units started during April .....		100,000
Units completed during April and transferred out to finished-goods inventory .....		80,000
Work in process, April 30		
Direct material: 100% complete		
Conversion: 33 1/3% complete		
Costs incurred during April:		
Direct material .....		<u>\$198,000</u>
Conversion costs:		
Direct labor .....		\$ 52,800
Applied manufacturing overhead .....		105,600
Total conversion costs .....		<u>\$158,400</u>

**Required:**

Prepare schedules to accomplish each of the following process-costing steps for the month of April. Use the FIFO method of process costing.

1. Analysis of physical flow of units.
2. Calculation of equivalent units.
3. Computation of unit costs.
4. Analysis of total costs.

Neptune Corporation accumulates costs for its single product using process costing. Direct material is added at the beginning of the production process, and conversion activity occurs uniformly throughout the process. A partially completed production report for the month of May follows.

■ **Problem 13**  
Partial Production Report; Journal Entries; FIFO Method

**Production Report  
For the Month of May**

	Physical Units	Percentage of Completion with Respect to Conversion	Equivalent Units		
			Direct Material	Conversion	
Work in process, May 1 . . . . .	25,000	40%			
Units started during May . . . . .	30,000				
Total units to account for . . . . .	<u>55,000</u>				
Units completed and transferred out during May . . . . .	35,000		35,000	35,000	
Work in process, May 31 . . . . .	20,000	80%	20,000	16,000	
Total units accounted for . . . . .	<u>55,000</u>				
			<b>Direct</b>		
			<b>Material</b>	<b>Conversion</b>	
			<b>Total</b>		
Work in process, May 1 . . . . .			\$143,000	\$ 474,700	\$ 617,700
Costs incurred during May . . . . .			165,000	2,009,000	2,174,000
Total costs to account for . . . . .			<u>\$308,000</u>	<u>\$2,483,700</u>	<u>\$2,791,700</u>

**Required:**

Use FIFO process costing to complete the following requirements.

1. Prepare a schedule of equivalent units.
2. Compute the costs per equivalent unit.
3. Compute the cost of goods completed and transferred out during May.
4. Compute the cost remaining in the work-in-process inventory on May 31.
5. Prepare a journal entry to record the transfer of the cost of goods completed and transferred out during May.
6. How would the production report be different if the company used weighted-average process costing?

■ **Problem 14**

Partial Production Report;  
Journal Entries; FIFO Method

Atlantic City Taffy Company produces various kinds of candy, but salt-water taffy is by far its most important product. The company accumulates costs for its product using process costing. Direct material is added at the beginning of the production process, and conversion activity occurs uniformly throughout the process.

**Production Report  
For the Month of August**

	Physical Units	Percentage of Completion with Respect to Conversion	Equivalent Units		
			Direct Material	Conversion	
Work in process, August 1 . . . . .	40,000	80%			
Units started during August . . . . .	80,000				
Total units to account for . . . . .	<u>120,000</u>				
Units completed and transferred out during August . . . . .	100,000		100,000	100,000	
Work in process, August 31 . . . . .	20,000	30%	20,000	6,000	
Total units accounted for . . . . .	<u>120,000</u>				
			<b>Direct</b>		
			<b>Material</b>	<b>Conversion</b>	
			<b>Total</b>		
Work in process, August 1 . . . . .			\$ 42,000	\$ 305,280	\$ 347,280
Costs incurred during August . . . . .			96,000	784,400	880,400
Total costs to account for . . . . .			<u>\$138,000</u>	<u>\$1,089,680</u>	<u>\$1,227,680</u>

**Required:**

1. Complete each of the following process-costing steps using FIFO process costing.
  - a. Calculation of equivalent units.
  - b. Computation of unit costs.
  - c. Analysis of total costs.
2. Prepare a journal entry to record the transfer of the cost of goods completed and transferred out during August.
3. How would the production report be different if the company used weighted-average process costing?

The following data pertain to the Coating Department of Trenton Ceramics Company for August.

Work in process, August 1 (in units) . . . . .	?
Units started during August . . . . .	?
Total units to account for . . . . .	?
Units completed and transferred out during August . . . . .	70,000
Work in process, August 31 (in units) . . . . .	50,000
Total equivalent units: direct material . . . . .	?
Total equivalent units: conversion . . . . .	?
New equivalent units accomplished in August: direct material . . . . .	80,000
New equivalent units accomplished in August: conversion . . . . .	?
Work in process, August 1: direct material . . . . .	\$304,000
Work in process, August 1: conversion . . . . .	?
Costs incurred during August: direct material . . . . .	612,000
Costs incurred during August: conversion . . . . .	?
Work in process, August 1: total cost . . . . .	?
Total costs incurred during August . . . . .	1,493,400
Total costs to account for . . . . .	1,933,400
Cost per equivalent unit: direct material . . . . .	?
Cost per equivalent unit: conversion . . . . .	?
Total cost per equivalent unit . . . . .	?
Cost of goods completed and transferred out during August . . . . .	?
Cost remaining in ending work-in-process inventory: direct material . . . . .	?
Cost remaining in ending work-in-process inventory: conversion . . . . .	?
Total cost of August 31 work in process . . . . .	?

**■ Problem 15**  
Missing Data; Production Report; FIFO

**Additional Information:**

- Direct material is added at the beginning of the production process, and conversion activity occurs uniformly throughout the process.
- Trenton Ceramics Company uses FIFO process costing.
- The August 1 work in process was 30 percent complete as to conversion.
- The August 31 work in process was 40 percent complete as to conversion.

**Required:**

Compute the missing amounts, and prepare the August production report for the Coating Department.

## Cases

Garden Life Company manufactures a plant nutrient known as Garden Pride. The manufacturing process begins in the Grading Department when raw materials are started in process. Upon completion of processing in the Grading Department, the output is transferred to the Saturating Department for the final phase of production. Here the product is saturated with water and then dried again. There is no weight gain in the process, and the water is virtually cost-free. The following information is available for the month of November.

**■ Case 16**  
Sequential Production Departments; FIFO; (Appendix to Chapter 4)

Work-in-Process Inventories	November 1		November 30
	Quantity (pounds)	Cost	Quantity (pounds)
Grading Department . . . . .	None	—	None
Saturating Department . . . . .	1,600	\$17,600*	2,000

\*Includes \$3,750 in Saturating Department conversion costs.

The work-in-process inventory in the Saturating Department is estimated to be 50 percent complete both at the beginning and end of November. Costs of production for November are as follows:

Costs of Production	Materials Used	Conversion
Grading Department . . . . .	\$265,680	\$86,400
Saturating Department . . . . .	—	85,920

The material used in the Grading Department weighed 36,000 pounds.

**Required:**

Use the FIFO method to prepare production reports for both the Grading and Saturating Departments for the month of November. In calculating unit costs, round your answer to four decimal places. The answer should include:

1. Equivalent units of production (in pounds).
2. Total manufacturing costs.
3. Cost per equivalent unit (pounds).
4. Cost of ending work-in-process inventory.
5. Cost of goods completed and transferred out.

(CPA, adapted)

■ **Case 17**

FIFO Process Costing;  
Sequential Departments;  
Two Types of Direct Material;  
Ethics (Appendix to  
Chapter 4)

Wood Glow Manufacturing Co. produces a wood refinishing kit that sells for \$17.95. The final processing of the kits occurs in the Packaging Department. A quilted wrap is applied at the beginning of the packaging process. A compartmentalized outside box printed with instructions and the company's name and logo is added when units are 60 percent through the process. Conversion costs, consisting of direct labor and applied overhead, occur evenly throughout the packaging process. Conversion activities after the addition of the box involve package sealing, testing for leakage, and final inspection. The following data pertain to the activities of the Packaging Department during the month of October.

- Beginning work-in-process inventory was 10,000 units, 40 percent complete as to conversion.
- 40,000 units were transferred to Packaging during October.
- There were 10,000 units in ending work in process, 80 percent complete as to conversion.

The Packaging Department's October costs were as follows:

Quilted wrap . . . . .	\$80,000
Outside boxes . . . . .	50,000
Direct labor . . . . .	22,000
Applied overhead (\$3.00 per direct-labor dollar) . . . . .	66,000

The costs transferred in from prior processing were \$3.00 per unit. The cost of goods sold for the month was \$240,000, and the ending finished-goods inventory was \$84,000. Wood Glow uses the first-in, first-out (FIFO) method for inventory valuation and for process costing. Wood Glow's controller, Mark Brandon, has been asked to analyze the activities of the Packaging Department for the month of October.

**Required:**

1. Prepare a schedule of equivalent units for the October activity in the Packaging Department. (*Hint:* You will need two columns for direct material: wrap and boxes.)
2. Determine the cost per equivalent unit of the October production.



3. Wood Glow's production manager, Jerry Drake, has been under pressure from the company president to reduce the cost of conversion in the Packaging Department. Although Drake has initiated various changes in the process to try to bring the cost down, he has been unsuccessful. Now Drake is faced with an early November meeting with the president, at which Drake will have to discuss the packaging cost and explain his failed attempts. Drake has approached Brandon, Wood Glow's controller and a close friend, with the following request: "Mark, I've got to show some cost reduction in the Packaging Department. Even a little bit will help me get through next week's meeting. Then I can work on the problem without the president breathing down my neck. I want you to do me a favor. Let's call October's ending inventory 95 percent complete instead of 80 percent. This will increase the number of equivalent units and lower the unit costs."  
By how much would Drake's proposal lower the kit's unit cost? What should Brandon do?

(CMA, adapted)