Questions & Solutions

Cost Accounting

A Managerial Emphasis

15th Edition

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Chapter - 17

Process Costing


QUESTIONS

MyAccountingLab

Questions

17-1 Give three examples of industries that use process-costing systems.

17-2 In process costing, why are costs often divided into two main classifications?

17-3 Explain equivalent units. Why are equivalent-unit calculations necessary in process costing?

17-4 What problems might arise in estimating the degree of completion of semiconductor chips in a semiconductor plant?

17-5 Name the five steps in process costing when equivalent units are computed.

17-6 Name the three inventory methods commonly associated with process costing.

17-7 Describe the distinctive characteristic of weighted-average computations in assigning costs to units completed and to units in ending work in process.

17-8 Describe the distinctive characteristic of FIFO computations in assigning costs to units completed and to units in ending work in process.

17-9 Why should the FIFO method be called a modified or department FIFO method?

17-10 Identify a major advantage of the FIFO method for purposes of planning and control.

17-11 Identify the main difference between journal entries in process costing and job costing.

17-12 "The standard-costing method is particularly applicable to process-costing situations." Do you agree? Why?

17-13 Why should the accountant distinguish between transferred-in costs and additional direct material costs for each subsequent department in a process-costing system?

17-14 "Transferred-in costs are those costs incurred in the preceding accounting period." Do you agree? Explain.

17-15 "There's no reason for me to get excited about the choice between the weighted-average and FIFO methods in my process-costing system. I have long-term contracts with my materials suppliers at fixed prices." Do you agree with this statement made by a plant controller? Explain.

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Exercises

17-16 Equivalent units, zero beginning inventory. Candid, Inc., is a manufacturer of digital cameras. It has two departments: assembly and testing. In January 2014, the company incurred $800,000 on direct materials and $805,000 on conversion costs, for a total manufacturing cost of $1,605,000.

Required

1. Assume there was no beginning inventory of any kind on January 1, 2014. During January, 5,000 cameras were placed into production and all 5,000 were fully completed at the end of the month. What is the unit cost of an assembled camera in January?
2. Assume that during February 5,000 cameras are placed into production. Further assume the same total assembly costs for January are also incurred in February, but only 4,000 cameras are fully completed at the end of the month. All direct materials have been added to the remaining 1,000 cameras. However, on average, these remaining 1,000 cameras are only 60% complete as to conversion costs. (a) What are the equivalent units for direct materials and conversion costs and their respective costs per equivalent unit for February? (b) What is the unit cost of an assembled camera in February 2014?
3. Explain the difference in your answers to requirements 1 and 2.

17-17 Journal entries (continuation of 17-16). Refer to requirement 2 of Exercise 17-16.

Required

Prepare summary journal entries for the use of direct materials and incurrence of conversion costs. Also prepare a journal entry to transfer out the cost of goods completed. Show the postings to the Work in Process account.

17-18 Zero beginning inventory, materials introduced in middle of process. Pilar Chemicals has a mixing department and a refining department. Its process-costing system in the mixing department has two direct materials cost categories (chemical P and chemical Q) and one conversion costs pool. The following data pertain to the mixing department for July 2014:

Units	
Work in process, July 1	0
Units started	100,000
Completed and transferred to refining department	70,000
Costs	
Chemical P	$600,000
Chemical Q	140,000
Conversion costs	360,000

Chemical P is introduced at the start of operations in the mixing department, and chemical Q is added when the product is three-fourths completed in the mixing department. Conversion costs are added evenly during the process. The ending work in process in the mixing department is two-thirds complete.

Required

1. Compute the equivalent units in the mixing department for July 2014 for each cost category.
2. Compute (a) the cost of goods completed and transferred to the refining department during July and (b) the cost of work in process as of July 31, 2014.

17-19 Weighted-average method, equivalent units. The assembly division of Fenton Watches, Inc., uses the weighted-average method of process costing. Consider the following data for the month of May 2014:

	Physical Units (Watches)	Direct Materials	Conversion Costs
Beginning work in process (May 1)[a]	80	$ 493,360	$ 91,040
Started in May 2014	500		
Completed during May 2014	460		
Ending work in process (May 31)[b]	120		
Total costs added during May 2014		$3,220,000	$1,392,000

[a]Degree of completion: direct materials, 90%; conversion costs, 40%.
[b]Degree of completion: direct materials, 60%; conversion costs, 30%.

Required

Compute equivalent units for direct materials and conversion costs. Show physical units in the first column of your schedule.

17-20 Weighted-average method, assigning costs (continuation of 17-19).

Required

For the data in Exercise 17-19, summarize the total costs to account for, calculate the cost per equivalent unit for direct materials and conversion costs, and assign costs to the units completed (and transferred out) and units in ending work in process.

17-21 FIFO method, equivalent units. Refer to the information in Exercise 17-19. Suppose the assembly division at Fenton Watches, Inc., uses the FIFO method of process costing instead of the weighted-average method.

Required

Compute equivalent units for direct materials and conversion costs. Show physical units in the first column of your schedule.

17-22 FIFO method, assigning costs (continuation of 17-21).

Required

For the data in Exercise 17-19, use the FIFO method to summarize the total costs to account for, calculate the cost per equivalent unit for direct materials and conversion costs, and assign costs to units completed (and transferred out) and to units in ending work in process.

17-23 Operation costing. Whole Goodness Bakery needs to determine the cost of two work orders for the month of June. Work order 215 is for 2,400 packages of dinner rolls, and work order 216 is for 2,800 loaves of multigrain bread. Dinner rolls are mixed and cut into individual rolls before being baked and then

packaged. Multigrain loaves are mixed and shaped before being baked, sliced, and packaged. The following information applies to work order 215 and work order 216:

	Work Order 215	Work Order 216
Quantity (packages)	2,400	2,800
Operations		
1. Mix	Use	Use
2. Shape loaves	Do not use	Use
3. Cut rolls	Use	Do not use
4. Bake	Use	Use
5. Slice loaves	Do not use	Use
6. Package	Use	Use

Selected budget information for June follows:

	Dinner Rolls	Multigrain Loaves	Total
Packages	9,600	13,000	22,600
Direct material costs	$5,280	$11,700	$ 16,980

Budgeted conversion costs for each operation for June follow:

Mixing	$18,080
Shaping	3,250
Cutting	1,440
Baking	14,690
Slicing	1,300
Packaging	16,950

Required

1. Using budgeted number of packages as the denominator, calculate the budgeted conversion-cost rates for each operation.
2. Using the information in requirement 1, calculate the budgeted cost of goods manufactured for the two June work orders.
3. Calculate the cost per package of dinner rolls and multigrain loaves for work order 215 and 216.

17-24 Weighted-average method, assigning costs. Tomlinson Corporation is a biotech company based in Milpitas. It makes a cancer-treatment drug in a single processing department. Direct materials are added at the start of the process. Conversion costs are added evenly during the process. Tomlinson uses the weighted-average method of process costing. The following information for July 2014 is available.

		Equivalent Units	
	Physical Units	Direct Materials	Conversion Costs
Work in process, July 1	8,700[a]	8,700	2,175
Started during July	34,500		
Completed and transferred out during July	32,000	32,000	32,000
Work in process, July 31	11,200[b]	11,200	7,840

[a]Degree of completion: direct materials, 100%; conversion costs, 25%.
[b]Degree of completion: direct materials, 100%; conversion costs, 70%.

Total Costs for July 2014		
Work in process, beginning		
Direct materials	$61,500	
Conversion costs	43,200	$104,700
Direct materials added during July		301,380
Conversion costs added during July		498,624
Total costs to account for		$904,704

Required

1. Calculate the cost per equivalent unit for direct materials and conversion costs.
2. Summarize the total costs to account for, and assign them to units completed (and transferred out) and to units in ending work in process.

17-25 FIFO method, assigning costs.

Required

1. Do Exercise 17-24 using the FIFO method.
2. Tomlinson's management seeks to have a more consistent cost per equivalent unit. Which method of process costing should the company choose and why?

17-26 Transferred-in costs, weighted-average method. Trendy Clothing, Inc., is a manufacturer of winter clothes. It has a knitting department and a finishing department. This exercise focuses on the finishing department. Direct materials are added at the end of the process. Conversion costs are added evenly during the process. Trendy uses the weighted-average method of process costing. The following information for June 2014 is available.

	A	B	C	D	E
1		Physical Units (tons)	Transferred-In Costs	Direct Materials	Conversion Costs
2	Work in process, beginning inventory (June 1)	60	$ 60,000	$ 0	$24,000
3	Degree of completion, beginning work in process		100%	0%	50%
4	Transferred in during June	100			
5	Completed and transferred out during June	120			
6	Work in process, ending inventory (June 30)	40			
7	Degree of completion, ending work in process		100%	0%	75%
8	Total costs added during June		$117,000	$27,000	$62,400

Required

1. Calculate equivalent units of transferred-in costs, direct materials, and conversion costs.
2. Summarize the total costs to account for, and calculate the cost per equivalent unit for transferred-in costs, direct materials, and conversion costs.
3. Assign costs to units completed (and transferred out) and to units in ending work in process.

17-27 Transferred-in costs, FIFO method. Refer to the information in Exercise 17-26. Suppose that Trendy uses the FIFO method instead of the weighted-average method in all of its departments. The only changes to Exercise 17-26 under the FIFO method are that total transferred-in costs of beginning work in process on June 1 are $45,000 (instead of $60,000) and total transferred-in costs added during June are $114,000 (instead of $117,000).

Required

Do Exercise 17-26 using the FIFO method. Note that you first need to calculate equivalent units of work done in the current period (for transferred-in costs, direct materials, and conversion costs) to complete beginning work in process, to start and complete new units, and to produce ending work in process.

17-28 Operation costing. Purex produces three different types of detergents: Breeze, Fresh, and Joy. The company uses four operations to manufacture the detergents: spray drying, mixing, blending, and packaging. Breeze and Fresh are produced in powder form in the mixing department, while Joy is produced in liquid form in the blending department. The powder detergents are packed in 50-ounce paperboard cartons, and the liquid detergent is packed in 50-ounce bottles made of recycled plastic.

Purex applies conversion costs based on labor-hours in the spray drying department. It takes 1½ minutes to mix the ingredients for a 50-ounce container for each product. Conversion costs are applied based on the number of containers in the mixing and blending departments and on the basis of machine-hours in the packaging department. It takes 0.3 minutes of machine time to fill a 50-ounce container, regardless of the product.

The budgeted number of containers and expected direct materials cost for each type of detergent are as follows:

	Breeze	Fresh	Joy
Number of 50-ounce containers	11,000	8,000	21,000
Direct materials cost	$21,450	$20,000	$52,500

The budgeted conversion costs for each department for July are as follows:

Department	Budgeted Conversion Cost
Spray Drying	$ 8,000
Mixing	22,800
Blending	30,450
Packaging	1,000

Required

1. Calculate the conversion cost rates for each department.
2. Calculate the budgeted cost of goods manufactured for Breeze, Fresh, and Joy for the month of July.
3. Calculate the cost per 50-ounce container for each type of detergent for the month of July.

17-29 Standard-costing with beginning and ending work in process. Priscilla's Pearls Company (PPC) is a manufacturer of knock-off jewelry. Priscilla attends Fashion Week in New York City every September and February to gauge the latest fashion trends in jewelry. She then makes jewelry at a fraction of the cost of those designers who participate in Fashion Week. This fall's biggest item is triple-stranded pearl necklaces. Because of her large volume, Priscilla uses process costing to account for her production. In October, she had started some of the triple strands. She continued to work on those in November. Costs and output figures are as follows:

Priscilla's Pearls Company Process Costing
For the Month Ended November 30, 2014

	Units	Direct Materials	Conversion Costs
Standard cost per unit		$ 2.40	$ 9.00
Work in process, beginning inventory (Nov. 1)	29,000	$ 69,600	$ 156,600
Degree of completion of beginning work in process		100%	60%
Started during November	124,200		
Completed and transferred out	127,000		
Work in process, ending inventory (Nov. 30)	26,200		
Degree of completion of ending work in process		100%	40%
Total costs added during November		$327,500	$1,222,000

Required

1. Compute equivalent units for direct materials and conversion costs. Show physical units in the first column of your schedule.
2. Compute the total standard costs of pearls transferred out in November and the total standard costs of the November 30 inventory of work in process.
3. Compute the total November variances for direct materials and conversion costs.

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Problems

17-30 Equivalent units, comprehensive. Louisville Sports manufactures baseball bats for use by players in the major leagues. A critical requirement for elite players is that each bat they use have an identical look and feel. As a result, Louisville uses a dedicated process to produce bats to each player's specifications.

One of Louisville's key clients is Ryan Brown of the Green Bay Brewers. Producing his bat involves the use of three materials—ash, cork, and ink—and a sequence of 20 standardized steps. Materials are added as follows:

Ash: This is the basic wood used in bats. Eighty percent of the ash content is added at the start of the process; the rest is added at the start of the 16th step of the process.

Cork: This is inserted into the bat in order to increase Ryan's bat speed. Half of the cork is introduced at the beginning of the seventh step of the process; the rest is added at the beginning of the 14th step.

Ink: This is used to stamp Ryan's name on the finished bat and is added at the end of the process.

Of the total conversion costs, 6% are added during each of the first 10 steps of the process, and 4% are added at each of the remaining 10 steps.

On May 1, 2014, Louisville had 100 bats in inventory. These bats had completed the ninth step of the process as of April 30, 2014. During May, Louisville put another 60 bats into production. At the end of May, Louisville was left with 40 bats that had completed the 12th step of the production process.

Required

1. Under the weighted-average method of process costing, compute equivalent units of work done for each relevant input for the month of May.
2. Under the FIFO method of process costing, compute equivalent units of work done for each relevant input for the month of May.

17-31 Weighted-average method. Larsen Company manufactures car seats in its San Antonio plant. Each car seat passes through the assembly department and the testing department. This problem focuses on the assembly department. The process-costing system at Larsen Company has a single direct-cost category (direct materials) and a single indirect-cost category (conversion costs). Direct materials are added at the beginning of the process. Conversion costs are added evenly during the process. When the assembly department finishes work on each car seat, it is immediately transferred to testing.

Larsen Company uses the weighted-average method of process costing. Data for the assembly department for October 2014 are as follows:

	Physical Units (Car Seats)	Direct Materials	Conversion Costs
Work in process, October 1[a]	5,000	$1,250,000	$ 402,750
Started during October 2014	20,000		
Completed during October 2014	22,500		
Work in process, October 31[b]	2,500		
Total costs added during October 2014		$4,500,000	$2,337,500

[a]Degree of completion: direct materials,?%; conversion costs, 60%.
[b]Degree of completion: direct materials,?%; conversion costs, 70%.

Required

1. For each cost category, compute equivalent units in the assembly department. Show physical units in the first column of your schedule.
2. What issues should the manager focus on when reviewing the equivalent units calculation?
3. For each cost category, summarize total assembly department costs for October 2014 and calculate the cost per equivalent unit.
4. Assign costs to units completed and transferred out and to units in ending work in process.

17-32 Journal entries (continuation of 17-31).

Required

Prepare a set of summarized journal entries for all October 2014 transactions affecting Work in Process—Assembly. Set up a T-account for Work in Process—Assembly and post your entries to it.

17-33 FIFO method (continuation of 17-31).

Required

1. Do Problem 17-31 using the FIFO method of process costing. Explain any difference between the cost per equivalent unit in the assembly department under the weighted-average method and the FIFO method.
2. Should Larsen's managers choose the weighted-average method or the FIFO method? Explain briefly.

17-34 Transferred-in costs, weighted-average method (related to 17-31 to 17-33). Larsen Company, as you know, is a manufacturer of car seats. Each car seat passes through the assembly department and testing department. This problem focuses on the testing department. Direct materials are added when the testing department process is 90% complete. Conversion costs are added evenly during the testing department's process. As work in assembly is completed, each unit is immediately transferred to testing. As each unit is completed in testing, it is immediately transferred to Finished Goods.

Larsen Company uses the weighted-average method of process costing. Data for the testing department for October 2014 are as follows:

	Physical Units (Car Seats)	Transferred-In Costs	Direct Materials	Conversion Costs
Work in process, October 1[a]	7,500	$2,932,500	$ 0	$ 835,460
Transferred in during October 2014	?			
Completed during October 2014	26,300			
Work in process, October 31[b]	3,700			
Total costs added during October 2014		$7,717,500	$9,704,700	$3,955,900

[a]Degree of completion: transferred-in costs,?%; direct materials,?%; conversion costs, 70%.
[b]Degree of completion: transferred-in costs,?%; direct materials,?%; conversion costs, 60%.

Required

1. What is the percentage of completion for (a) transferred-in costs and direct materials in beginning work-in-process inventory and (b) transferred-in costs and direct materials in ending work-in-process inventory?
2. For each cost category, compute equivalent units in the testing department. Show physical units in the first column of your schedule.
3. For each cost category, summarize total testing department costs for October 2014, calculate the cost per equivalent unit, and assign costs to units completed (and transferred out) and to units in ending work in process.
4. Prepare journal entries for October transfers from the assembly department to the testing department and from the testing department to Finished Goods.

17-35 Transferred-in costs, FIFO method (continuation of 17-34). Refer to the information in Problem 17-34. Suppose that Larsen Company uses the FIFO method instead of the weighted-average method in all of its departments. The only changes to Problem 17-34 under the FIFO method are that total transferred-in costs of beginning work in process on October 1 are $2,800,000 (instead of $2,932,500) and that total transferred-in costs added during October are $7,735,250 (instead of $7,717,500).

Required

Using the FIFO process-costing method, complete Problem 17-34.

17-36 Weighted-average method. McKnight Handcraft is a manufacturer of picture frames for large retailers. Every picture frame passes through two departments: the assembly department and the finishing department. This problem focuses on the assembly department. The process-costing system at McKnight has a single direct-cost category (direct materials) and a single indirect-cost category (conversion costs). Direct materials are added when the assembly department process is 10% complete. Conversion costs are added evenly during the assembly department's process.

McKnight uses the weighted-average method of process costing. Consider the following data for the assembly department in April 2014:

	Physical Unit (Frames)	Direct Materials	Conversion Costs
Work in process, April 1[a]	60	$ 1,530	$ 156
Started during April 2014	510		
Completed during April 2014	450		
Work in process, April 30[b]	120		
Total costs added during April 2014		$17,850	$11,544

[a]Degree of completion: direct materials, 100%; conversion costs, 40%.
[b]Degree of completion: direct materials, 100%; conversion costs, 15%.

Required

1. Summarize the total assembly department costs for April 2014, and assign them to units completed (and transferred out) and to units in ending work in process.
2. What issues should a manager focus on when reviewing the equivalent units calculation?

17-37 FIFO method (continuation of 17-36).

Required

1. Complete Problem 17-36 using the FIFO method of process costing.
2. If you did Problem 17-36, explain any difference between the cost of work completed and transferred out and the cost of ending work in process in the assembly department under the weighted-average method and the FIFO method. Should McKnight's managers choose the weighted-average method or the FIFO method? Explain briefly.

17-38 Transferred-in costs, weighted-average method. Publishers, Inc., has two departments: printing and binding. Each department has one direct-cost category (direct materials) and one indirect-cost category (conversion costs). This problem focuses on the binding department. Books that have undergone the printing process are immediately transferred to the binding department. Direct material is added when the binding process is 70% complete. Conversion costs are added evenly during binding operations. When those operations are done, the books are immediately transferred to Finished Goods. Publishers, Inc., uses the weighted-average method of process costing. The following is a summary of the April 2014 operations of the binding department.

	A	B	C	D	E
1		Physical Units (books)	Transferred-In Costs	Direct Materials	Conversion Costs
2	Beginning work in process	1,260	$ 39,060	$ 0	$16,380
3	Degree of completion, beginning work in process		100%	0%	50%
4	Transferred in during April 2014	2,880			
5	Completed and transferred out during April	3,240			
6	Ending work in process (April 30)	900			
7	Degree of completion, ending work in process		100%	0%	70%
8	Total costs added during April		$155,520	$28,188	$84,240

Required

1. Summarize total binding department costs for April 2014, and assign these costs to units completed (and transferred out) and to units in ending work in process.
2. Prepare journal entries for April transfers from the printing department to the binding department and from the binding department to Finished Goods.

17-39 Transferred-in costs, FIFO method. Refer to the information in Problem 17-38. Suppose that Publishers, Inc., uses the FIFO method instead of the weighted-average method in all of its departments. The only changes to Problem 17-38 under the FIFO method are that total transferred-in costs of beginning work in process on April 1 are $44,100 (instead of $39,060) and that total transferred-in costs added during April are $149,760 (instead of $155,520).

Required

1. Using the FIFO process-costing method, complete Problem 17-38.
2. If you did Problem 17-38, explain any difference between the cost of work completed and transferred out and the cost of ending work in process in the binding department under the weighted-average method and the FIFO method.

17-40 Transferred-in costs, weighted-average and FIFO methods. Portland Pale Ale, Inc., makes a variety of specialty beers at its main brewery in Oregon. Production of beer occurs in three main stages: mashing, boiling, and fermenting. Consider the fermenting department, where direct materials (bottles and other packaging) are added at the end of the process. Conversion costs are added evenly during the process.

Portland Pale Ale provides the following information related to its top-selling Gypsum Ale for the fermenting department for the month of July:

	Physical Units (Cases)	Transferred-In Costs	Direct Materials	Conversion Costs
~~Beginning work in process~~	~~2,500~~	~~$116,000~~	~~$ 0~~	~~$ 37,500~~
Transferred in during July from boiling department	10,000			
Completed during July	10,500			
Ending work in process, July 31	2,000			
Total costs added during July		$384,000	$110,775	$152,250

The units in beginning work in process are 25% complete for conversion costs, while the units in ending inventory are 50% complete for conversion costs.

Required

1. Using the weighted-average method, summarize the total fermenting department costs for July, and assign costs to units completed (and transferred out) and to units in ending work in process.
2. Assume that the FIFO method is used for the fermenting department. Under FIFO, the transferred-in costs for work-in-process beginning inventory in July are $115,680 (instead of $116,000 under the weighted-average method), and the transferred-in costs during July from the boiling department are $376,000 (instead of $384,000 under the weighted-average method). All other data are unchanged. Summarize the total fermenting department costs for July, and assign costs to units completed and transferred out and to units in ending work in process using the FIFO method.

17-41 Multiple processes or operations, costing. The Sedona Company is dedicated to making products that meet the needs of customers in a sustainable manner. Sedona is best known for its KLN water bottle, which is a BPA-free, dishwasher-safe, bubbly glass bottle in a soft silicone sleeve.

The production process consists of three basic operations. In the first operation, the glass is formed by remelting cullets (broken or refuse glass). In the second operation, the glass is assembled with the silicone gasket and sleeve. The resulting product is finished in the final operation with the addition of the polypropylene cap.

Consulting studies have indicated that of the total conversion costs required to complete a finished unit, the forming operation requires 60%, the assembly 30%, and the finishing 10%.

The following data are available for March 2014 (there is no opening inventory of any kind):

Cullets purchased	$67,500
Silicone purchased	$24,000
Polypropylene used	$ 6,000
Total conversion costs incurred	$68,850
Ending inventory, cullets	$ 4,500
Ending inventory, silicone	$ 3,000
Number of bottles completed and transferred	12,000
Inventory in process at the end of the month:	
Units formed but not assembled	4,000
Units assembled but not finished	2,000

Required

1. What is the cost per equivalent unit for conversion costs for KLN bottles in March 2014?
2. Compute the cost per equivalent unit with respect to each of the three materials: cullets, silicone, and polypropylene.
3. What is the cost of goods completed and transferred out?
4. What is the cost of goods formed but not assembled?
5. What is the cost of goods assembled but not finished?

17-42 Benchmarking, ethics. Amanda McNall is the corporate controller of Scott Quarry. Scott Quarry operates 12 rock-crushing plants in Scott County, Kentucky, that process huge chunks of limestone rock extracted from underground mines.

Given the competitive landscape for pricing, Scott's managers pay close attention to costs. Each plant uses a process-costing system, and at the end of every quarter, each plant manager submits a production report and a production-cost report. The production report includes the plant manager's estimate of the percentage of completion of the ending work in process as to direct materials and conversion costs, as well as the level of processed limestone inventory. McNall uses these estimates to compute the cost per equivalent unit of work done for each input for the quarter. Plants are ranked from 1 to 12, and the three plants with the lowest cost per equivalent unit for direct materials and conversion costs are each given a bonus and recognized in the company newsletter.

McNall has been pleased with the success of her benchmarking program. However, she has recently received anonymous emails that two plant managers have been manipulating their monthly estimates of percentage of completion in an attempt to obtain the bonus.

Required

1. Why and how might managers manipulate their monthly estimates of percentage of completion and level of inventory?
2. McNall's first reaction is to contact each plant controller and discuss the problem raised by the anonymous communications. Is that a good idea?
3. Assume that each plant controller's primary reporting responsibility is to the plant manager and that each plant controller receives the phone call from McNall mentioned in requirement 2. What is the ethical responsibility of each plant controller (a) to Amanda McNall and (b) to Scott Quarry in relation to the equivalent-unit and inventory information each plant provides?
4. How might McNall learn whether the data provided by particular plants are being manipulated?

17-43 Standard-costing method. Hi-sense Technologies produces stripped-down phones for sale to customers in frontier economies. The firm purchases used or obsolete models of specific smartphone models. It removes nonstandard applications, installs open source Android software, and unlocks the phone so it can operate on GSM networks. Hi-sense's most popular offering is the iZoom phone.

Given the importance of scaling and cost control for the success of its business model, Hi-sense uses a standard-costing system. The following information is available for the second quarter of 2014 (April 1–June 30):

Physical and Equivalent Units for iZoom
For the Second Quarter of 2014

		Equivalent Units	
	Physical Units	Direct Materials	Conversion Costs
Completion of beginning work in process	1,158,000	—	521,100
Started and completed	1,014,000	1,014,000	1,014,000
Work on ending work in process	2,180,400	2,180,400	1,308,240
Units to account for	4,352,400	3,194,400	2,843,340

	Costs
Cost of units completed from beginning work in process	$ 9,206,100
Cost of new units started and completed	8,061,300
Cost of units completed in the second quarter	17,267,400
Cost of ending work in process	14,630,484
Total costs accounted for	$31,897,884

Required

1. What are the completion percentages of iZoom phones in beginning work-in-process inventory with respect to the two inputs?
2. What are the completion percentages of iZoom phones in ending work-in-process inventory with respect to the two inputs?
3. What are the standard costs per unit for direct materials and conversion costs?
4. What is the total cost of work-in-process inventory as of April 1, 2014 (the start of the second quarter)?

SOLUTIONS

CHAPTER 17
PROCESS COSTING

17-1 Industries using process costing in their manufacturing areas include chemical processing, oil refining, pharmaceuticals, plastics, brick and tile manufacturing, semiconductor chips, beverages, and breakfast cereals.

17-2 Process costing systems separate costs into cost categories according to the timing of when costs are introduced into the process. Often, only two cost classifications, direct materials and conversion costs, are necessary. Direct materials are frequently added at one point in time, often the start or the end of the process. All conversion costs are added at about the same time but in a pattern different from direct materials costs. Conversion costs are often added throughout the process, which can of any length of time, lasting from seconds to several months.

17-3 Equivalent units is a derived amount of output units that takes the quantity of each input (factor of production) in units completed or in incomplete units in work in process and converts the quantity of input into the amount of completed output units that could be made with that quantity of input. Each equivalent unit is comprised of the physical quantities of direct materials or conversion costs inputs necessary to produce output of one fully completed unit. Equivalent unit measures are necessary because all physical units are not completed to the same extent at the same time.

17-4 The accuracy of the estimates of completion depends on the care and skill of the estimator and the nature of the process. Semiconductor chips may differ substantially in the finishing necessary to obtain a final product. The amount of work necessary to finish a product may not always be easy to ascertain in advance.

17-5 The five key steps in process costing follow:
Step 1: Summarize the flow of physical units of output.
Step 2: Compute output in terms of equivalent units.
Step 3: Summarize total costs to account for.
Step 4: Compute cost per equivalent unit.
Step 5: Assign total costs to units completed and to units in ending work in process.

17-6 Three inventory methods associated with process costing are

- weighted average.
- first-in, first-out.
- standard costing.

17-7 The weighted-average process-costing method calculates the equivalent-unit cost of all the work done to date (regardless of the accounting period in which it was done), assigns this cost to equivalent units completed and transferred out of the process, and to equivalent units in ending work-in-process inventory.

17-8 FIFO computations are distinctive because they assign the cost of the previous accounting period's equivalent units in beginning work-in-process inventory to the first units completed and transferred out of the process and assign the cost of equivalent units worked on during the current period first to complete beginning inventory, next to start and complete new units, and finally to units in ending work-in-process inventory. In contrast, the weighted-average method costs units completed and transferred out and in ending work in process at the same average cost.

17-9 FIFO should be called a modified or departmental FIFO method because the goods transferred in during a given period usually bear a single average unit cost (rather than a distinct FIFO cost for each unit transferred in) as a matter of convenience.

17-10 A major advantage of FIFO is that managers can judge the performance in the current period independently from the performance in the preceding period.

17-11 The journal entries in process costing are basically similar to those made in job-costing systems. The main difference is that, in process costing, there is often more than one work-in-process account—one for each process.

17-12 Standard-cost procedures are particularly appropriate to process-costing systems where there are various combinations of materials and operations used to make a wide variety of similar products as in the textiles, paints, and ceramics industries. Standard-cost procedures also avoid the intricacies involved in detailed tracking with weighted-average or FIFO methods when there are frequent price variations over time.

17-13 There are two reasons why the accountant should distinguish between *transferred-in costs* and *additional direct materials costs* for a particular department:

(a) All direct materials may not be added at the beginning of the department process.
(b) The control methods and responsibilities may be different for transferred-in items and materials added in the department.

17-14 No. Transferred-in costs or previous department costs are costs incurred in a previous department that have been charged to a subsequent department. These costs may be costs incurred in that previous department during this accounting period or a preceding accounting period.

17-15 Materials are only one cost item. Other items (often included in a conversion costs pool) include labor, energy, and maintenance. If the costs of these items vary over time, this variability can cause a difference in cost of goods sold and inventory amounts when the weighted-average or FIFO methods are used.

A second factor is the amount of inventory on hand at the beginning or end of an accounting period. The smaller the amount of production held in beginning or ending inventory relative to the total number of units transferred out, the smaller the effect on operating income, cost of goods sold, or inventory amounts from the use of weighted-average or FIFO methods.

17-16 (25 min.) **Equivalent units, zero beginning inventory.**

1.	Direct materials cost per unit ($800,000 ÷ 5,000)	$ 160.00
	Conversion cost per unit ($805,000 ÷ 5,000)	161.00
	Assembly Department cost per unit	$321.00

2a. Solution Exhibit 17-16A calculates the equivalent units of direct materials and conversion costs in the Assembly Department of Candid, Inc. in February 2014.

Solution Exhibit 17-16B computes equivalent unit costs.

2b.	Direct materials cost per unit	$ 160
	Conversion cost per unit	175
	Assembly Department cost per unit	$335

3. The difference in the Assembly Department cost per unit calculated in requirements 1 and 2 arises because the costs incurred in January and February are the same but fewer equivalent units of work are done in February relative to January. In January, all 5,000 units introduced are fully completed resulting in 5,000 equivalent units of work done with respect to direct materials and conversion costs. In February, of the 5,000 units introduced, 5,000 equivalent units of work is done with respect to direct materials but only 4,600 equivalent units of work is done with respect to conversion costs. The Assembly Department cost per unit is, therefore, higher.

SOLUTION EXHIBIT 17-16A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units;
Assembly Department of Candid, Inc., for February 2014.

	(Step 1)	(Step 2) Equivalent Units	
Flow of Production	**Physical Units**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	0		
Started during current period (given)	5,000		
To account for	5,000		
Completed and transferred out during current period	4,000	4,000	4,000
Work in process, ending* (given)	1,000		
1,000 × 100%; 1,000 × 60%		1,000	600
Accounted for	5,000		
Equivalent units of work done in current period		5,000	4,600

*Degree of completion in this department: direct materials, 100%; conversion costs, 60%.

SOLUTION EXHIBIT 17-16B
Compute the Cost per Equivalent Unit,
Assembly Department of Candid, Inc., for February 2014.

	Total Production Costs	Direct Materials	Conversion Costs
(**Step 3**) Costs added during February	$1,605,000	$800,000	$805,000
Divide by equivalent units of work done in current period (Solution Exhibit 17-l6A)		÷ 5,000	÷ 4,600
Cost per equivalent unit		$ 160	$ 175

17-17 (20 min.) **Journal entries (continuation of 17-16).**

1.	Work in Process—Assembly	800,000	
	Accounts Payable		800,000
	To record $800,000 of direct materials purchased and used in production during February 2014		
2.	Work in Process—Assembly	805,000	
	Various accounts		805,000
	To record $805,000 of conversion costs for February 2014; examples include energy, manufacturing supplies, all manufacturing labor, and plant depreciation		
3.	Work in Process—Testing	1,340,000	
	Work in Process—Assembly		1,340,000
	To record 4,000 units completed and transferred from Assembly to Testing during February 2014 at $335 × 4,000 units = $1,340,000		

Postings to the Work in Process—Assembly account follow.

Work in Process — Assembly Department

Beginning inventory, Feb. 1	0	3. Transferred out to	
1. Direct materials	800,000	Work in Process—Testing	1,340,000
2. Conversion costs	805,000		
Ending inventory, Feb. 28	265,000		

17-18 (25 min.) **Zero beginning inventory, materials introduced in middle of process.**

1. Solution Exhibit 17-18A shows equivalent units of work done in the current period of Chemical P, 100,000; Chemical Q, 70,000; Conversion costs, 90,000.

2. Solution Exhibit 17-18B summarizes the total Mixing Department costs for July 2014, calculates cost per equivalent unit of work done in the current period for Chemical P, Chemical Q, and conversion costs, and assigns these costs to units completed (and transferred out) and to units in ending work in process.

SOLUTION EXHIBIT 17-18A
Summarize the Flow of Physical Units and Compute Output in Equivalent Units;
Mixing Department of Pilar Chemicals for July 2014.

	(Step 1)	(Step 2) Equivalent Units		
Flow of Production	**Physical Units**	**Chemical P**	**Chemical Q**	**Conversion Costs**
Work in process, beginning (given)	0			
Started during current period (given)	100,000			
To account for	100,000			
Completed and transferred out during current period	70,000	70,000	70,000	70,000
Work in process, ending* (given)	30,000			
30,000 × 100%; 30,000 × 0%; 30,000 × 66 2/3%		30,000	0	20,000
Accounted for	100,000			
Equivalent units of work done in current period		100,000	70,000	90,000

*Degree of completion in this department: Chemical P, 100%; Chemical Q, 0%; conversion costs, 66 2/3%.

SOLUTION EXHIBIT 17-18B
Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Mixing Department of Pilar Chemicals for July 2014.

	Total Production Costs	Chemical P	Chemical Q	Conversion Costs
(**Step 3**) Costs added during July	$1,100,000	$600,000	$140,000	$360,000
Total costs to account for	$1,100,000	$600,000	$140,000	$360,000
(Step 4) Costs added in current period		$600,000	$140,000	$360,000
Divide by equivalent units of work done in current period (Solution Exhibit 17-l8A)		÷ 100,000	÷70,000	÷ 90,000
Cost per equivalent unit		$ 6	$ 2	$ 4
(Step 5) Assignment of costs:				
Completed and transferred out (50,000 units)	$840,000	(70,000* × $6)	+ (70,000* × $2)	+ (70,000* × $4)
Work in process, ending (30,000 units)	260,000	(30,000† × $6)	+ (0† × $2)	+ (20,000† × $4)
Total costs accounted for	$1,100,000	$600,000	+ $140,000	+ $360,000

*Equivalent units completed and transferred out from Solution Exhibit 17-18A, Step 2.
†Equivalent units in ending work in process from Solution Exhibit 17-18A, Step 2.

17-19 (15 min.) **Weighted-average method, equivalent units.**

Under the weighted-average method, equivalent units are calculated as the equivalent units of work done to date. Solution Exhibit 17-19 shows equivalent units of work done to date for the Assembly Division of Fenton Watches, Inc., for direct materials and conversion costs.

SOLUTION EXHIBIT 17-19
Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Assembly Division of Fenton Watches, Inc., for May 2014.

Flow of Production	(Step 1) Physical Units	(Step 2) Equivalent Units	
		Direct Materials	Conversion Costs
Work in process beginning (given)	80		
Started during current period (given)	500		
To account for	580		
Completed and transferred out during current period	460	460	460
Work in process, ending* (120 × 60%; 120 × 30%)	120	72	36
Accounted for	580		
Equivalent units of work done to date		532	496

*Degree of completion in this department: direct materials, 60%; conversion costs, 30%.

17-20 (20 min.) **Weighted-average method, assigning costs (continuation of 17-19).**

Solution Exhibit 17-20 summarizes total costs to account for, calculates cost per equivalent unit of work done to date in the Assembly Division of Fenton Watches, Inc., and assigns costs to units completed and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-20
Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory;
Weighted-Average Method of Process Costing, Assembly Division of Fenton Watches, Inc., for May 2014.

		Total Production Costs	Direct Materials	Conversion Costs
(**Step 3**)	Work in process, beginning (given)	$ 584,400	$ 493,360	$ 91,040
	Costs added in current period (given)	4,612,000	3,220,000	1,392,000
	Total costs to account for	$5,196,400	$3,713,360	$1,483,040
(**Step 4**)	Costs incurred to date		$3,713,360	$1,483,040
	Divide by equivalent units of work done to date (Solution Exhibit 17-19)		÷ 532	÷ 496
	Cost per equivalent unit of work done to date		$ 6,980	$ 2,990
(**Step 5**)	Assignment of costs:			
	Completed and transferred out (460 units)	$4,586,200	(460* × $6,980)	+ (460* × $2,990)
	Work in process, ending (120 units)	610,200	(72† × $6,980)	+ (36† × $2,990)
	Total costs accounted for	$5,196,400	$3,713,360	+ $1,483,040

*Equivalent units completed and transferred out from Solution Exhibit 17-19, Step 2.
†Equivalent units in work in process, ending from Solution Exhibit 17-19, Step 2.

17-21 (15 min.) **FIFO method, equivalent units.**

Under the FIFO method, equivalent units are calculated as the equivalent units of work done in the current period only. Solution Exhibit 17-21 shows equivalent units of work done in May 2014 in the Assembly Division of Fenton Watches, Inc., for direct materials and conversion costs.

SOLUTION EXHIBIT 17-21
Summarize the Flow of Physical Units and Compute Output in Equivalent Units;
FIFO Method of Process Costing, Assembly Division of Fenton Watches, Inc., for May 2014.

	(Step 1)	(Step 2) Equivalent Units	
Flow of Production	**Physical Units**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	80	(work done before current period)	
Started during current period (given)	500		
To account for	580		
Completed and transferred out during current period:			
From beginning work in process[§]	80		
80 × (100% − 90%); 80 × (100% − 40%)		8	48
Started and completed	380[†]		
380 × 100%, 380 × 100%		380	380
Work in process, ending[*] (given)	120		
120 × 60%; 120 × 30%		72	36
Accounted for	580		
Equivalent units of work done in current period		460	464

[§]Degree of completion in this department: direct materials, 90%; conversion costs, 40%.
[†]460 physical units completed and transferred out minus 80 physical units completed and transferred out from beginning work-in-process inventory.
*Degree of completion in this department: direct materials, 60%; conversion costs, 30%.

17-22 (20 min.) **FIFO method, assigning costs (continuation of 17-21).**

Solution Exhibit 17-22 summarizes total costs to account for, calculates cost per equivalent unit of work done in May 2014 in the Assembly Division of Fenton Watches, Inc., and assigns total costs to units completed and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-22
Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory;
FIFO Method of Process Costing, Assembly Division of Fenton Watches, Inc., for May 2014.

	Total Production Costs	Direct Materials	Conversion Costs
(**Step 3**) Work in process, beginning (given)	$ 584,400	$ 493,360	$ 91,040
Costs added in current period (given)	4,612,000	3,220,000	1,392,000
Total costs to account for	$5,196,400	$3,713,360	$1,483,040
(**Step 4**) Costs added in current period		$3,220,000	$1,392,000
Divide by equivalent units of work done in current period (Solution Exhibit 17-21)		÷ 460	÷ 464
Cost per equiv. unit of work done in current period		$ 7,000	$ 3,000
(**Step 5**) Assignment of costs:			
Completed and transferred out (460 units):			
Work in process, beginning (80 units)	$ 584,400	$493,360 +	$91,040
Costs added to beginning work in process in current period	200,000	($8^{*} \times \$7{,}000$) +	($48^{*} \times \$3{,}000$)
Total from beginning inventory	784,400		
Started and completed (380 units)	3,800,000	($380^{\dagger} \times \$7{,}000$) +	($380^{\dagger} \times \$3{,}000$)
Total costs of units completed and transferred out	4,584,400		
Work in process, ending (120 units)	612,000	($72^{\#} \times \$7{,}000$) +	($36^{\#} \times \$3{,}000$)
Total costs accounted for	$5,196,400	$3,713,360 +	$1,483,040

*Equivalent units used to complete beginning work in process from Solution Exhibit 17-21, Step 2.
†Equivalent units started and completed from Solution Exhibit 17-21, Step 2.
#Equivalent units in work in process, ending from Solution Exhibit 17-21, Step 2.

17-23 (20-25 min.) **Operation costing.**

1. To obtain the conversion-cost rates, divide the budgeted cost of each operation by the number of packages that are expected to go through that operation.

	Budgeted Conversion Cost	Budgeted Number of Packages	Conversion Cost per Package
Mixing	$18,080	22,600	$0.80
Shaping	3,250	13,000	0.25
Cutting	1,440	9,600	0.15
Baking	14,690	22,600	0.65
Slicing	1,300	13,000	0.10
Packaging	16,950	22,600	0.75

2.

	Work Order #215	Work Order #216
Bread type:	Dinner Roll	Multigrain Loaves
Quantity:	2,400	2,800
Direct Materials	$ 1,320	$2,520
Mixing	1,920	2,240
Shaping	0	700
Cutting	360	0
Baking	1,560	1,820
Slicing	0	280
Packaging	1,800	2,100
Total	$ 6,960	$9,660

The direct materials costs per unit vary based on the type of bread ($5,280 ÷ 9,600 = $0.55 for the dinner rolls, and $11,700 ÷ 13,000 = $0.90 for the multigrain loaves). Conversion costs are charged using the rates computed in part (1), taking into account the specific operations that each type of bread actually goes through.

3.

Work order #215 (Dinner rolls):		Work order #216 (Multigrain loaves):	
Total cost	$ 6,960	Total cost:	$9,660
Divided by number of packages:	÷ 2,400	Divided by number of packages:	÷2,800
Cost per package of dinner rolls:	$ 2.90	Cost per package of multigrain loaves:	$ 3.45

17-24 (25 min.) **Weighted-average method, assigning costs.**

1. & 2. Solution Exhibit 17-24A shows equivalent units of work done to date for Tomlinson Corporation for direct materials and conversion costs.

Solution Exhibit 17-24B summarizes total costs to account for, calculates the cost per equivalent unit of work done to date for direct materials and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-24A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Tomlinson Corporation for July 2014.

	(Step 1)	(Step 2) Equivalent Units	
	Physical	Direct	Conversion
Flow of Production	Units	Materials	Costs
Work in process, beginning (given)	8,700		
Started during current period (given)	34,500		
To account for	43,200		
Completed and transferred out during current period	32,000	32,000	32,000
Work in process, ending* (given)	11,200		
11,200 × 100%; 11,200 × 70%		11,200	7,840
Accounted for	43,200		
Equivalent units of work done to date		43,200	39,840

*Degree of completion: direct materials, 100%; conversion costs, 70%.

SOLUTION EXHIBIT 17-24B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing for Tomlinson Corporation for July 2014.

		Total Production Costs	Direct Materials	Conversion Costs
(Step 3)	Work in process, beginning (given)	$104,700	$ 61,500	$ 43,200
	Costs added in current period (given)	800,004	301,380	498,624
	Total costs to account for	$904,704	$362,880	$541,824
(Step 4)	Costs incurred to date		$362,880	$541,824
	Divide by equivalent units of work done to date (Solution Exhibit 17-24A)		÷ 43,200	÷ 39,840
	Cost per equivalent unit of work done to date		$ 8.40	$ 13.60
(Step 5)	Assignment of costs:			
	Completed and transferred out (32,000 units)	$704,000	(32,000* × $8.40) +	(32,000* × $13.60)
	Work in process, ending (11,200 units)	200,704	(11,200† × $8.40) +	(7,840† × $13.60)
	Total costs accounted for	$904,704	$362,880 +	$541,824

*Equivalent units completed and transferred out (given).
†Equivalent units in ending work in process (given).

17-25 (30 min.) **FIFO method, assigning costs.**

1. Solution Exhibit 17-25A calculates the equivalent units of work done in the current period. Solution Exhibit 17-25B summarizes total costs to account for, calculates the cost per equivalent unit of work done in the current period for direct materials and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-25A
Summarize the Flow of Physical Units and Compute Output in Equivalent Units;
FIFO Method of Process Costing, Tomlinson Corporation for July 2014.

		(Step 2)	
	(Step 1)	Equivalent Units	
	Physical	Direct	Conversion
Flow of Production	**Units**	**Materials**	**Costs**
Work in process, beginning (given)	8,700	(work done before current period)	
Started during current period (given)	34,500		
To account for	43,200		
Completed and transferred out during current period:			
From beginning work in process[§]			
8,700 × (100% − 100%); 8,700 × (100% – 25%)	8,700	0	6,525
Started and completed			
23,300 × 100%, 23,300 × 100%	23,300[†]	23,300	23,300
Work in process, ending* (given)			
11,200 × 100%; 11,200 × 70%	11,200	11,200	7,840
Accounted for	43,200		
Equivalent units of work done in current period		34,500	37,665

[§]Degree of completion in this department: direct materials, 100%; conversion costs, 25%.
[†]32,000 physical units completed and transferred out minus 8,700 physical units completed and transferred out from beginning work-in-process inventory.
*Degree of completion in this department: direct materials, 100%; conversion costs, 70%.

SOLUTION EXHIBIT 17-25B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Tomlinson Corporation for July 2014.

	Total Production Costs	Direct Materials	Conversion Costs
(**Step 3**) Work in process, beginning (given)	$104,700	$ 61,500	$ 43,200
Costs added in current period (given)	800,004	301,380	498,624
Total costs to account for	$904,704	$362,880	$541,824
(**Step 4**) Costs added in current period		$301,380	$498,624
Divide by equivalent units of work done in current period (Solution Exhibit 17-25A)		÷ 34,500	÷ 37,665
Cost per equivalent unit of work done in current period		$ 8.74	$ 13.24
(**Step 5**) Assignment of costs:			
Completed and transferred out (33,000 units):			
Work in process, beginning (8,500 units)	$104,700	$61,500	+ $43,200
Cost added to beginning work in process in current period	86,381	(0* × $8.74)	+ (6,525* × $13.24)
Total from beginning inventory	191,081		
Started and completed (24,500 units)	511,995	(23,300† × $8.74)	+ (23,300† × $13.24)
Total costs of units completed and transferred out	703,076		
Work in process, ending (10,500 units)	201,628	(11,200# × $8.74)	+ (7,840# × $13.24)
Total costs accounted for	$904,704	$362,880	+ $541,824

*Equivalent units used to complete beginning work in process from Solution Exhibit 17-25A, Step 2.
†Equivalent units started and completed from Solution Exhibit 17-25A, Step 2.
#Equivalent units in ending work in process from Solution Exhibit 17-25A, Step 2.

2. Using the weighted average method will result in a greater degree of cost smoothing because the cost of beginning inventory is mixed together with costs added each period. This will produce a more consistent cost per equivalent unit than the FIFO method.

In the case of Tomlinson Corporation, note that the direct material cost per equivalent unit went from $7.07 in the prior period ($61,500 ÷ 8,700 units) to $8.74 in July, while the conversion cost per equivalent unit decreased from $19.86 ($43,200 ÷ 2,175 equivalent units in opening work-in-process) to $13.24 in July. Under the weighted-average method, these costs and equivalent units are combined into consistent, blended rates of $8.40 and $13.60 for direct materials and conversion costs, respectively.

17-26 (35–40 min.) **Transferred-in costs, weighted-average method.**

1, 2. & 3. Solution Exhibit 17-26A calculates the equivalent units of work done to date. Solution Exhibit 17-26B summarizes total costs to account for, calculates the cost per equivalent unit of work done to date for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-26A
Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Finishing Department of Trendy Clothing for June 2014.

	(Step 1)	(Step 2) Equivalent Units		
Flow of Production	**Physical Units**	**Transferred-in Costs**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	60			
Transferred in during current period (given)	100			
To account for	160			
Completed and transferred out during current period	120	120	120	120
Work in process, ending* (given)	40			
40 × 100%; 40 × 0%; 40 × 75%		40	0	30
Accounted for	160			
Equivalent units of work done to date		160	120	150

*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 75%.

SOLUTION EXHIBIT 17-26B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Finishing Department of Trendy Clothing for June 2014.

		Total Production Costs	Transferred-in Costs	Direct Materials	Conversion Costs
(Step 3)	Work in process, beginning (given)	$84,000	$ 60,000	$ 0	$24,000
	Costs added in current period (given)	206,400	117,000	27,000	62,400
	Total costs to account for	$290,400	$ 177,000	$27,000	$86,400
(Step 4)	Costs incurred to date		$ 117,000	$27,000	$86,400
	Divide by equivalent units of work done to date (Solution Exhibit 17-26A)		÷ 160	÷ 120	÷ 150
	Cost per equivalent unit of work done to date		$1,106.25	$ 225	$ 576
(Step 5)	Assignment of costs:				
	Completed and transferred out (120 units)	$228,870	(120[a] × $1,106.25)	+ (120[a] × $225)	+ (120[a] × $576)
	Work in process, ending (40 units):	61,530	(40[b] × $1,105.25)	+ (0[b] × $225)	+ (30[b] × $576)
	Total costs accounted for	$290,400	$ 177,000	+ $27,000	+ $86,400

[a] Equivalent units completed and transferred out from Sol. Exhibit 17-26A, step 2.
[b] Equivalent units in ending work in process from Sol. Exhibit 17-26A, step 2.

17-27 (35–40 min.) **Transferred-in costs, FIFO method.**

Solution Exhibit 17-27A calculates the equivalent units of work done in the current period (for transferred-in costs, direct-materials, and conversion costs) to complete beginning work-in-process inventory, to start and complete new units, and to produce ending work in process. Solution Exhibit 17-27B summarizes total costs to account for, calculates the cost per equivalent unit of work done in the current period for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-27A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Finishing Department of Trendy Clothing for June 2014.

	(Step 1)	(Step 2) Equivalent Units		
Flow of Production	**Physical Units**	**Transferred-in Costs**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	60	(work done before current period)		
Transferred-in during current period (given)	100			
To account for	160			
Completed and transferred out during current period:				
From beginning work in process[a]	60			
[60 × (100% – 100%); 60 × (100% – 0%); 60 × (100% – 50%)]		0	60	30
Started and completed	60[b]			
(60 × 100%; 60 × 100%; 60 × 100%)		60	60	60
Work in process, ending[c] (given)	40			
(40 × 100%; 40 × 0%; 40 × 75%)		40	0	30
Accounted for	160			
Equivalent units of work done in current period		100	120	120

[a]Degree of completion in this department: Transferred-in costs, 100%; direct materials, 0%; conversion costs, 50%.

[b]120 physical units completed and transferred out minus 60 physical units completed and transferred out from beginning work-in-process inventory.

[c]Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 75%.

SOLUTION EXHIBIT 17-27B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Finishing Department of Trendy Clothing for June 2014.

		Total Production Costs	Transferred-in Costs	Direct Materials	Conversion Costs
(Step 3)	Work in process, beginning (given)	$ 69,000	$ 45,000	$ 0	$ 24,000
	Costs added in current period (given)	203,400	114,000	27,000	62,400
	Total costs to account for	$272,400	$159,000	$27,000	$86,400
(Step 4)	Costs added in current period		$114,000	$27,000	$ 62,400
	Divide by equivalent units of work done in current period (Solution Exhibit 17-27A)		÷ 100	÷ 120	÷ 120
	Cost per equivalent unit of work done in current period		$ 1,140	$ 225	$ 520
(Step 5)	Assignment of costs:				
	Completed and transferred out (160 units)				
	Work in process, beginning (60 units)	$ 69,000	$45,000	+ $0	+ $24,000
	Costs added to beginning work in process in current period	29,100	(0^{a} × $1,140)	+ (60^{a} × $225)	+ (30^{a} × $520)
	Total from beginning inventory	98,100			
	Started and completed (60 units)	113,100	(60^{b} × $1,140)	+ (60^{b} × $225)	+ (60^{b} × $520)
	Total costs of units completed and transferred out	211,200			
	Work in process, ending (40 units):	61,200	(40^{c} × $1,140)	+ (0^{c} × $225)	+ (30^{c} × $520)
	Total costs accounted for	$272,400	$159,000	+ $27,000	+ $86,400

[a] Equivalent units used to complete beginning work in process from Solution Exhibit 17-27A, step 2.
[b] Equivalent units started and completed from Solution Exhibit 17-27A, step 2.
[c] Equivalent units in ending work in process from Solution Exhibit 17-27A, step 2.

17-28 (15-20 min.) **Operation costing.**

1. Calculate the conversion cost rates for each department:

	Breeze	Fresh	Joy	Total
Budgeted 50-oz. containers	11,000	8,000	21,000	40,000
Budgeted labor hours	275[a]	200[c]	525[e]	1,000
Budgeted machine hours	55[b]	40[d]	105[f]	200

[a] 11,000 × 1.5 minutes ÷ 60 minutes/hour = 275 hours
[b] 11,000 × 0.3 minutes ÷ 60 minutes/hour = 55 hours
[c] 8,000 × 1.5 minutes ÷ 60 minutes/hour = 200 hours
[d] 8,000 × 0.3 minutes ÷ 60 minutes/hour = 40 hours
[e] 21,000 × 1.5 minutes ÷ 60 minutes/hour = 525 hours
[f] 21,000 × 0.3 minutes ÷ 60 minutes/hour = 105 hours

	Budgeted Conversion Cost	Cost Driver	Budgeted Quantity of Cost Driver	Conversion Cost Rate
Spray Drying	$ 8,000	Labor hours	1,000	$8.00 per labor hour
Mixing	22,800	# of containers	19,000	$1.20 per container
Blending	30,450	# of containers	21,000	$1.45 per container
Packaging	1,000	Machine hours	200	$5.00 per machine hour

2. Budgeted cost of goods manufactured:

	Breeze	Fresh	Joy
Direct Materials	$21,450	$20,000	$52,500
Spray Drying[g]	2,200	1,600	4,200
Mixing[h]	13,200	9,600	0
Blending	0	0	30,450
Packaging[i]	275	200	525
Total	$37,125	$31,400	$87,675

[g] $8.00 per labor hour × (275; 200; 525 labor hours)
[h] $1.20 per container × (11,000; 8,000 containers)
[i] $5.00 per machine hour × (55; 40; 105 machine hours)

3. Budgeted cost per container

	Breeze	Fresh	Joy
Total budgeted costs	$37,125	$31,400	$87,675
Number of containers	11,000	8,000	21,000
Budgeted cost per container	$ 3.375	$ 3.925	$ 4.175

17-29 (30-35 min.) **Standard-costing with beginning and ending work in process.**

1. Solution Exhibit 17-29A computes the equivalent units of work done in November 2014 by Priscilla's Pearls Company for direct materials and conversion costs.

2. and 3. Solution Exhibit 17-29B summarizes total costs of the Priscilla's Pearls Company for November 30, 2014, and using the standard cost per equivalent unit for direct materials and conversion costs, assigns these costs to units completed and transferred out and to units in ending work in process. The exhibit also summarizes the cost variances for direct materials and conversion costs for November 2014.

SOLUTION EXHIBIT 17-29A
Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Standard Costing Method of Process Costing, Priscilla's Pearls Company for the Month Ended November 30, 2014.

	(Step 1)	(Step 2) Equivalent Units	
Flow of Production	**Physical Units**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	29,000	(work done before current period)	
Started during current period (given)	124,200		
To account for	153,200		
Completed and transferred out during current period:			
From beginning work in process[§]	29,000		
29,000 × (100% – 100%); 29,000 × (100% – 60%)		0	11,600
Started and completed	98,000[†]		
98,000 × 100%, 98,000 × 100%		98,000	98,000
Work in process, ending* (given)	26,200		
26,200 × 100%; 26,200 × 40%		26,200	10,480
Accounted for	153,200		
Equivalent units of work done in current period		124,200	120,080

[§]Degree of completion in this department: direct materials, 100%; conversion costs, 60%.

[†]127,000 physical units completed and transferred out minus 29,000 physical units completed and transferred out from beginning work-in-process inventory.

*Degree of completion in this department: direct materials, 100%; conversion costs, 40%.

SOLUTION EXHIBIT 17-29B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Standard-Costing Method of Process Costing, Priscilla's Pearls Company for the Month Ended November 30, 2014.

	Total Production Costs	Direct Materials		Conversion Costs
(Step 3) Work in process, beginning (given)	$ 226,200	$ 69,600	+	$ 156,600
Costs added in current period at standard costs	1,378,800	(124,200 × 2.40)	+	(120,080 × $9.00)
Total costs to account for	$1,605,000	$367,680	+	$1,237,320
(Step 4) Standard cost per equivalent unit (given)		$ 2.40		$ 9.00
(Step 5) Assignment of costs at standard costs:				
Completed and transferred out (127,000 units):				
Work in process, beginning (29,000 units)	$ 226,200	$69,600	+	$156,600
Costs added to beg. work in process in current period	104,400	(0* × $2.40)	+	(11,600* × $9.00)
Total from beginning inventory	330,600			
Started and completed (98,000 units)	1,117,200	(98,000† × $2.40)	+	(98,000† × $9.00)
Total costs of units transferred out	1,447,800			
Work in process, ending (26,200 units)	157,200	(26,200# × $2.40)	+	(10,480# × $9.00)
Total costs accounted for	$1,605,000	$367,680	+	$1,237,320
Summary of variances for current performance:				
Costs added in current period at standard costs (see Step 3 above)		$298,080		$1,080,720
Actual costs incurred (given)		327,500		1,222,000
Variance		$ 29,420 U		$ 141,280 U

*Equivalent units to complete beginning work in process from Solution Exhibit 17-29A, Step 2.

†Equivalent units started and completed from Solution Exhibit 17-29A, Step 2.

#Equivalent units in ending work in process from Solution Exhibit 17-29A, Step 2.

17-30 (30 min.) **Equivalent units, comprehensive.**

1. Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Louisville Sports for May 2014.

	(Step 1)	(Step 2) Equivalent Units			
Flow of Production	**Physical Units**	**Ash**	**Cork**	**Ink**	**Conversion Costs**
Work in process, beginning (given)	100				
Started during current period (given)	60				
To account for	160				
Completed and transferred out during current period	120	120	120	120	120
Work in process, ending* (given)	40				
40 × 80%; 50%; 0%; 68%		32	20	0	27.2
Accounted for	160				
Equivalent units of work done to date		152	140	120	147.2

*Degree of completion in this department: Step 12 of production process: Ash, 80%; Cork, 50%; Ink, 0%; Conversion costs, (6% × 10 steps) + (4% × 2 steps) = 68%.

2. Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Louisville Sports for May 2014.

	(Step 1)	(Step 2) Equivalent Units			
Flow of Production	**Physical Units**	**Ash**	**Cork**	**Ink**	**Conversion Costs**
Work in process, beginning (given)	100				
Started during current period (given)	60				
To account for	160				
Completed and transferred out during current period:					
From beginning work in process§	100				
100 × 20%; 50%; 100%; 46%		20	50	100	46
Started and completed†	20				
20 × 100%; 100%; 100%; 100%		20	20	20	20
Work in process, ending* (given)	40				
40 × 80%; 50%; 0%; 68%		32	20	0	27.2
Accounted for	160				
Equivalent units of work done in May		72	90	120	93.2

§Degree of completion in this department: Step 9 of production process: Ash, 80%; Cork, 50%; Ink, 0%; conversion costs, 6% × 9 steps = 54%. The difference between 100% and these numbers represents the amount of work done to complete the beginning work in process in this period.

†120 bats completed and transferred out minus 100 bats completed and transferred out from beginning work-in-process inventory.

*Degree of completion in this department: Step 12 of production process: Ash, 80%; Cork, 50%; Ink, 0%; conversion costs, (6% × 10 steps) + (4% × 2 steps) = 68%.

17-31 (25 min.) **Weighted-average method.**

1. Because direct materials are added at the beginning of the assembly process, the units in this department must be 100% complete with respect to direct materials. Solution Exhibit 17-31A shows equivalent units of work done to date:

Direct materials	25,000 equivalent units
Conversion costs	24,250 equivalent units

SOLUTION EXHIBIT 17-31A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Assembly Department of Larsen Company for October 2014.

	(Step 1)	(Step 2) Equivalent Units	
Flow of Production	**Physical Units**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	5,000		
Started during current period (given)	20,000		
To account for	25,000		
Completed and transferred out during current period	22,500	22,500	22,500
Work in process, ending* (given)	2,500		
2,500 × 100%; 2,500 × 70%		2,500	1,750
Accounted for	25,000		
Equivalent units of work done to date		25,000	24,250

*Degree of completion in this department: direct materials, 100% (because they are added at the start of the process); conversion costs, 70%.

2. To show better performance, a department supervisor might report a higher degree of completion resulting in understated cost per equivalent unit and overstated operating income. If performance for the period is very good, the department supervisor may be tempted to report a lower degree of completion, reducing income in the current period. This has the effect of reducing the costs carried in ending inventory and the costs carried to the following year in beginning inventory. In other words, estimates of degree of completion can help to smooth earnings from one period to the next.

To guard against the possibility of bias, managers should ask supervisors specific questions about the process they followed to prepare estimates. Top management should always emphasize obtaining the correct answer, regardless of how it affects reported performance. This emphasis drives ethical actions throughout the organization.

3. & 4. Solution Exhibit 17-31B summarizes the total Assembly Department costs for October 2014, calculates cost per equivalent unit of work done to date**,** and assigns these costs to units completed (and transferred out) and to units in ending work in process using the weighted-average method.

SOLUTION EXHIBIT 17-31B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work in Process Inventory; Weighted-Average Method of Process Costing, Assembly Department of Larsen Company for October 2014.

		Total Production Costs	Direct Materials	Conversion Costs
(Step 3)	Work in process, beginning (given)	$1,652,750	$1,250,000	$ 402,750
	Costs added in current period (given)	6,837,500	4,500,000	2,337,500
	Total costs to account for	$8,490,250	$5,750,000	$2,740,250
(Step 4)	Costs incurred to date		$5,750,000	$2,740,250
	Divide by equivalent units of work done to date (Solution Exhibit 17-31A)		÷ 25,000	÷ 24,250
	Cost per equivalent unit of work done to date		$ 230	$ 113
(Step 5)	Assignment of costs:			
	Completed and transferred out (22,500 units)	$7,717,500	(22,500* × $230)	+ (22,500* × $113)
	Work in process, ending (2,500 units)	772,750	(2,500† × $230)	+ (1,750† × $113)
	Total costs accounted for	$8,490,250	$5,750,000	+ $2,740,250

*Equivalent units completed and transferred out from Solution Exhibit 17-31A, Step 2.
†Equivalent units in work in process, ending from Solution Exhibit 17-31A, Step 2.

17-32 (10 min.) **Journal entries (continuation of 17-31).**

1.	Work in Process—Assembly Department	4,500,000	
	Accounts Payable		4,500,000
	Direct materials purchased and used in production in October.		
2.	Work in Process—Assembly Department	2,337,500	
	Various accounts		2,337,500
	Conversion costs incurred in October.		
3.	Work in Process—Testing Department	7,717,500	
	Work in Process—Assembly Department		7,717,500
	Cost of goods completed and transferred out in October from the Assembly Department to the Testing Department.		

Work in Process—Assembly Department

Beginning inventory, October 1	1,652,750	3. Transferred out to Work in Process–Testing	7,717,500
1. Direct materials	4,500,000		
2. Conversion costs	2,337,500		
Ending Inventory, October 31	772,750		

17-33 (20 min.) **FIFO method (continuation of 17-31).**

1. The equivalent units of work done in the Assembly Department in October 2014 for direct materials and conversion costs are shown in Solution Exhibit 17-33A.

SOLUTION EXHIBIT 17-33A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Assembly Department of Larsen Company for October 2014.

	(Step 1)	(Step 2)	
		Equivalent Units	
Flow of Production	Physical Units	Direct Materials	Conversion Costs
Work in process, beginning (given)	5,000	(work done before current period)	
Started during current period (given)	20,000		
To account for	25,000		
Completed and transferred out during current period:			
From beginning work in process[§]			
5,000 × (100% – 100%); 5,000 × (100% – 60%)	5,000	0	2,000
Started and completed			
17,500 ×100%, 17,500 × 100%	17,000[†]	17,500	17,500
Work in process, ending* (given)	2,500		
2,500 × 100%; 2,500 × 70%		2,500	1,750
Accounted for	25,000		
Equivalent units of work done in current period		20,000	21,250

[§]Degree of completion in this department: direct materials, 100%; conversion costs, 60%.

[†]22,500 physical units completed and transferred out minus 5,000 physical units completed and transferred out from beginning work-in-process inventory.

*Degree of completion in this department: direct materials, 100%; conversion costs, 70%

The cost per equivalent unit of work done in the Assembly Department in October 2014 for direct materials and conversion costs is calculated in Solution Exhibit 17-33B. This exhibit also summarizes the total Assembly Department costs for October 2014 and assigns these costs to units completed (and transferred out) and units in ending work in process under the FIFO method.

SOLUTION EXHIBIT 17-33B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Assembly Department of Larsen Company for October 2014.

	Total Production Costs	Direct Materials	Conversion Costs
(**Step 3**) Work in process, beginning (given)	$1,652,750	$1,250,000	$ 402,750
Costs added in current period (given)	6,837,500	4,500,000	2,337,500
Total costs to account for	$8,490,250	$5,750,000	$2,740,250
(**Step 4**) Costs added in current period		$4,500,000	$2,337,500
Divide by equivalent units of work done in current period (Solution Exhibit 17-33A)		÷ 20,000	÷ 21,250
Cost per equivalent unit of work done in current period		$ 225	$ 110
(**Step 5**) Assignment of costs:			
Completed and transferred out (22,500 units):			
Work in process, beginning (5,000 units)	$1,652,750	$1,250,000 +	$ 402,750
Costs added to beg. work in process in current period	220,000	(0* × $225) +	(2,000* × $110)
Total from beginning inventory	1,872,750		
Started and completed (17,500 units)	5,862,500	(17,500† × $225) +	(17,500† × $110)
Total costs of units completed & transferred out	7,735,250		
Work in process, ending (2,500 units)	755,000	(2,500# × $225) +	(1,750# × $110)
Total costs accounted for	$8,490,250	$5,750,000 +	$2,740,250

*Equivalent units used to complete beginning work in process from Solution Exhibit 17-33A, Step 2.

†Equivalent units started and completed from Solution Exhibit 17-33A, Step 2.

#Equivalent units in ending work in process from Solution Exhibit 17-33A, Step 2.

2. The cost per equivalent unit of beginning inventory and of work done in the current period differ:

	Beginning Inventory	Work Done in Current Period
Direct materials	$250.00 ($1,250,000 ÷ 5,000 equiv. units)	$225.00
Conversion costs	134.25 ($ 402,750 ÷ 3,000 equiv. units)	110.00
Total cost per unit	$384.25	$335.00

	Direct Materials	Conversion Costs
Cost per equivalent unit (weighted-average)	$230*	$113*
Cost per equivalent unit (FIFO)	$225**	$110**

*from Solution Exhibit 17-31B

**from Solution Exhibit 17-33B

The cost per equivalent unit differs between the two methods because each method uses different costs as the numerator of the calculation. FIFO uses only the costs added during the current period, whereas weighted-average uses the costs from the beginning work-in-process as well as costs added during the current period. Both methods also use different equivalent units in the denominator.

The following table summarizes the costs assigned to units completed and those still in process under the weighted-average and FIFO process-costing methods for our example.

	Weighted Average (Solution Exhibit 17-31B)	FIFO (Solution Exhibit 17-33B)	Difference
Cost of units completed and transferred out	$7,717,500	$7,735,250	+ $17,750
Work in process, ending	772,750	755,000	– $17,750
Total costs accounted for	$8,490,250	$8,490,250	

The FIFO ending inventory is lower than the weighted-average ending inventory by $17,750. This is because FIFO assumes that all the higher-cost prior-period units in work in process are the first to be completed and transferred out, while ending work in process consists of only the lower-cost current-period units. The weighted-average method, in contrast, smoothes the cost per equivalent unit by assuming that more of the lower-cost units are completed and transferred out, while some higher-cost units in beginning work in process are placed in ending work in process. So, in this case, the weighted-average method results in a lower cost of units completed and transferred out and a higher ending work-in-process inventory relative to the FIFO method.

Larsen's managers should consider the FIFO method because even though it shows lower operating income and higher cost of goods sold, it lowers taxes. Managers may have an incentive, however, to use the weighted-average method and show higher income if the managers' compensation increases with higher operating income or if there are debt covenants that would be violated by showing lower income. Another advantage of the FIFO method is that it provides better information for managing the business because it keeps separate the costs of the current period from costs incurred in previous periods.

17-34 (30 min.) **Transferred-in costs, weighted-average method (related to 17-31 to 17-33).**

1. Transferred-in costs are 100% complete, and direct materials are 0% complete in both beginning and ending work-in-process inventory. The reason is that transferred-in costs are always 100% complete as soon as they are transferred in from the Assembly Department to the Testing Department. Direct materials in beginning or ending work in process for the Testing Department are 0% complete because direct materials are added only when the testing process is 90% complete and the units in beginning and ending work in process are only 70% and 60% complete, respectively.

2. Solution Exhibit 17-34A computes the equivalent units of work done to date in the Testing Department for transferred-in costs, direct materials, and conversion costs.

3. Solution Exhibit 17-34B summarizes total Testing Department costs for October 2014, calculates the cost per equivalent unit of work done to date in the Testing Department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the weighted-average method.

4. Journal entries:

a. Work in Process—Testing Department	7,717,500	
Work in Process—Assembly Department		7,717,500
Cost of goods completed and transferred out during October from the Assembly Department to the Testing Department		
b. Finished Goods	23,459,600	
Work in Process—Testing Department		23,459,600
Cost of goods completed and transferred out during October from the Testing Department to Finished Goods inventory		

SOLUTION EXHIBIT 17-34A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Testing Department of Larsen Company for October 2014.

	(Step 1)	(Step 2)		
		Equivalent Units		
Flow of Production	Physical Units	Transferred-in Costs	Direct Materials	Conversion Costs
Work in process, beginning (given)	7,500			
Transferred in during current period (given)	22,500			
To account for	30,000			
Completed and transferred out during current period	26,300	26,300	26,300	26,300
Work in process, ending* (given)	3,700			
3,700 × 100%; 3,700 × 0%; 3,700 × 60%		3,700	0	2,220
Accounted for	30,000			
Equivalent units of work done to date		30,000	26,300	28,520

*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 60%.

SOLUTION EXHIBIT 17-34B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Testing Department of Larsen Company for October 2014.

	Total Production Costs	Transferred -in Costs	Direct Materials	Conversion Costs
(**Step 3**) Work in process, beginning (given)	$ 3,767,960	$ 2,932,500	$ 0	$ 835,460
Costs added in current period (given)	21,378,100	7,717,500	9,704,700	3,955,900
Total costs to account for	$25,146,060	$10,650,000	$9,704,700	$4,791,360
(**Step 4**) Costs incurred to date		$10,650,000	$9,704,700	$4,791,360
Divide by equivalent units of work done to date (Solution Exhibit 17-34A)		÷ 30,000	÷ 26,300	÷ 28,520
Equivalent unit costs of work done to date		$ 355	$ 369	$ 168
(**Step 5**) Assignment of costs:				
Completed and transferred out (26,300 units)	$23,459,600	(26,300* × $355)	+ (26,300* × $369)	+ (26,300* × $168)
Work in process, ending (3,700 units)	1,686,460	(3,700† × $355)	+ (0† × $369)	+ (2,220† × $168)
Total costs accounted for	$25,146,060	$10,650,000	+ $9,704,700	+ $4,791,360

*Equivalent units completed and transferred out from Solution Exhibit 17-34A, Step 2.

†Equivalent units in ending work in process from Solution Exhibit 17-34A, Step 2.

17-35 (30 min.) **Transferred-in costs, FIFO method (continuation of 17-34).**

1. As explained in Problem 17-34, requirement 1, transferred-in costs are 100% complete and direct materials are 0% complete in both beginning and ending work-in-process inventory.

2. The equivalent units of work done in October 2014 in the Testing Department for transferred-in costs, direct materials, and conversion costs are calculated in Solution Exhibit 17-35A.

3. Solution Exhibit 17-35B summarizes total Testing Department costs for October 2014, calculates the cost per equivalent unit of work done in October 2014 in the Testing Department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the FIFO method.

4. Journal entries:

a. Work in Process—Testing Department	7,735,250	
Work in Process—Assembly Department		7,735,250
Cost of goods completed and transferred out during October from the Assembly Dept. to the Testing Dept.		
b. Finished Goods	23,381,891	
Work in Process—Testing Department		23,381,891
Cost of goods completed and transferred out during October from the Testing Department to Finished Goods inventory.		

SOLUTION EXHIBIT 17-35A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Testing Department of Larsen Company for October 2014.

		(Step 2) Equivalent Units		
Flow of Production	**(Step 1) Physical Units**	**Transferred-in Costs**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	7,500	(work done before current period)		
Transferred-in during current period (given)	22,500			
To account for	30,000			
Completed and transferred out during current period:				
From beginning work in process[§]	7,500			
7,500 × (100% – 100%); 7,500× (100% – 0%); 7,500× (100% – 70%)		0	7,500	2,250
Started and completed	18,800[†]			
18,800 × 100%; 18,800× 100%; 18,800× 100%		18,800	18,800	18,800
Work in process, ending* (given)	3,700			
3,700 × 100%; 3,700 × 0%; 3,700 × 60%		3,700	0	2,220
Accounted for	30,000			
Equivalent units of work done in current period		22,500	26,300	23,270

[§] Degree of completion in this department: Transferred-in costs, 100%; direct materials, 0%; conversion costs, 70%.

[†] 26,300 physical units completed and transferred out minus 7,500 physical units completed and transferred out from beginning work-in-process inventory.

*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 60%.

SOLUTION EXHIBIT 17-35B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Testing Department of Larsen Company for October 2014.

		Total Production Costs	Transferred-in Costs	Direct Materials	Conversion Costs
(**Step 3**)	Work in process, beginning (given)	$ 3,635,460	$ 2,800,000	$ 0	$ 835,460
	Costs added in current period (given)	21,395,850	7,735,250	9,704,700	3,955,900
	Total costs to account for	$25,031,310	$10,535,250	$9,704,700	$4,791,360
(**Step 4**)	Costs added in current period		$ 7,735,250	$9,704,700	$3,955,900
	Divide by equivalent units of work done in current period (Solution Exhibit 17-35A)		÷ 22,500	÷ 26,300	÷ 23,270
	Cost per equiv. unit of work done in current period		$ 343.79	$ 369.00	$ 170.00
(**Step 5**)	Assignment of costs:				
	Completed and transferred out (26,300 units):				
	Work in process, beginning (7,500 units)	$ 3,635,460	$2,800,000	+ $0	+ $835,460
	Costs added to beg. work in process in current period	3,150,000	(0* × $343.79)	+ (7,500* × $369.00)	+ (2,250* × $170.00)
	Total from beginning inventory	6,785,460			
	Started and completed (18,800 units)	16,596,431	(18,800† × $343.79)	+ (18,800† × $369.00)	+ (18,800† × $170.00)
	Total costs of units completed & transferred out	23,381,891			
	Work in process, ending (3,700 units)	1,649,419	(3,700# × $343.79)	+ (0# × $369.00)	+ (2,220# × $170.00)
	Total costs accounted for	$25,031,310	$10,617,125	+ $9,704,700	+ $4,791,360

*Equivalent units used to complete beginning work in process from Solution Exhibit 17-35A, Step 2.
†Equivalent units started and completed from Solution Exhibit 17-35A, Step 2.
#Equivalent units in ending work in process from Solution Exhibit 17-35A, Step 2.

17-36 (25 min.) **Weighted-average method.**

1. Solution Exhibit 17-36A shows equivalent units of work done to date of

Direct materials	570 equivalent units
Conversion costs	468 equivalent units

Note that direct materials are added when the Assembly Department process is 10% complete. Both the beginning and ending work in process are more than 10% complete and, hence, are 100% complete with respect to direct materials.

Solution Exhibit 17-35B summarizes the total Assembly Department costs for April 2014, calculates cost per equivalent unit of work done to date for direct materials and conversion costs, and assigns these costs to units completed (and transferred out), and to units in ending work in process using the weighted-average method.

SOLUTION EXHIBIT 17-36A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Assembly Department of McKnight Handcraft for April 2014.

	(Step 1)	(Step 2) Equivalent Units	
Flow of Production	**Physical Units**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	60		
Started during current period (given)	510		
To account for	570		
Completed and transferred out during current period	450	450	450
Work in process, ending* (given)	120		
120 × 100%; 120 × 15%		120	18
Accounted for	570		
Equivalent units of work done to date		570	468

*Degree of completion in this department: direct materials, 100%; conversion costs, 15%.

SOLUTION EXHIBIT 17-36B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Assembly Department of McKnight Handcraft for April 2014.

		Total Production Costs	Direct Materials	Conversion Costs
(Step 3)	Work in process, beginning (given)	$ 1,686	$ 1,530	$ 156
	Costs added in current period (given)	29,394	17,850	11,544
	Total costs to account for	$31,080	$19,380	$11,700
(**Step 4**)	Costs incurred to date		$19,380	$11,700
	Divide by equivalent units of work done to date (Solution Exhibit 17-36A)		÷ 570	÷ 468
	Cost per equivalent unit of work done to date		$ 34	$ 25
(**Step 5**)	Assignment of costs:			
	Completed and transferred out (450 units)	$26,550	(450* × $34)	+ (450* × $25)
	Work in process, ending (120 units)	4,530	(120† × $34)	+ (18† × $25)
	Total costs accounted for	$31,080	$19,380	+ $11,700

*Equivalent units completed and transferred out from Solution Exhibit 17-36A, Step 2.
†Equivalent units in ending work in process from Solution Exhibit 17-36A, Step 2.

2. To show better performance, a department supervisor might report a higher degree of completion, resulting in understated cost per equivalent unit and overstated operating income. If performance for the period is very good, the department supervisor may be tempted to report a lower degree of completion, reducing income in the current period. This has the effect of reducing the costs carried in ending inventory and the costs carried to the following year in beginning inventory. In other words, estimates of degree of completion can help to smooth earnings from one period to the next.

To guard against the possibility of bias, managers should ask supervisors specific questions about the process they followed to prepare estimates. Top management should always emphasize obtaining the correct answer, regardless of how it affects reported performance. This emphasis drives ethical actions throughout the organization.

17-37 (20 min.) **FIFO method (continuation of 17-36).**

1. & 2. The equivalent units of work done in April 2014 in the Assembly Department for direct materials and conversion costs are shown in Solution Exhibit 17-37A.

Solution Exhibit 17-37B summarizes the total Assembly Department costs for April 2014, calculates the cost per equivalent unit of work done in April 2014 in the Assembly Department for direct materials and conversion costs, and assigns these costs to units completed (and transferred out) and to units in ending work in process under the FIFO method.

The equivalent units of work done in beginning inventory is direct materials, 60 × 100% = 60 and conversion costs 60 × 40% = 24. The cost per equivalent unit of beginning inventory and of work done in the current period are

	Beginning Inventory	Work Done in Current Period (Calculated Under FIFO Method)
Direct materials	$25.50 ($1,530 ÷ 60)	$35
Conversion costs	$6.50 ($156 ÷ 24)	$26

The following table summarizes the costs assigned to units completed and those still in process under the weighted-average and FIFO process-costing methods for our example.

	Weighted Average (Solution Exhibit 17-36B)	FIFO (Solution Exhibit 17-37B)	Difference
Cost of units completed and transferred out	$26,550	$26,412	−$138
Work in process, ending	4,530	4,668	+$138
Total costs accounted for	$31,080	$31,080	

The FIFO ending inventory is higher than the weighted-average ending inventory by $138. This is because FIFO assumes that all the lower-cost prior-period units in work in process are the first to be completed and transferred out while ending work in process consists of only the higher-cost current-period units. The weighted-average method, however, smoothes out cost per equivalent unit by assuming that more higher-cost units are completed and transferred out, while some of the lower-cost units in beginning work in process are placed in ending work in process. Hence, in this case, the weighted-average method results in a higher cost of units completed and transferred out and a lower ending work-in-process inventory relative to the FIFO method.

Given the relatively small difference in the income numbers generated by the two methods, McKnight's managers would likely be indifferent between the two methods. If the differences are expected to be larger in future years, the managers should decide on the firm's method and choose the method that will lower McKnight's operating income and taxes. They may have an incentive, however, to use the alternate method in order to obtain higher levels of income-based compensation or if there are debt covenants that would be violated by showing lower income. One advantage of the FIFO method worth considering is that it provides better information for managing the business because it keeps separate the costs of the current period from costs incurred in previous periods.

SOLUTION EXHIBIT 17-37A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units;
FIFO Method of Process Costing, Assembly Department of McKnight Handcraft for April 2014.

		(Step 2) Equivalent Units	
Flow of Production	**(Step 1) Physical Units**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	60	(work done before current period)	
Started during current period (given)	510		
To account for	570		
Completed and transferred out during current period:			
From beginning work in process[§]	60		
60 × (100% − 100%); 60 × (100% − 40%)		0	36
Started and completed	390[†]		
390 × 100%; 390 × 100%		390	390
Work in process, ending* (given)	120		
120 × 100%; 120 × 15%		120	18
Accounted for	570		
Equivalent units of work done in current period		510	444

[§]Degree of completion in this department: direct materials, 100%; conversion costs, 40%.
[†]450 physical units completed and transferred out minus 60 physical units completed and transferred out from beginning work-in-process inventory.
*Degree of completion in this department: direct materials, 100%; conversion costs, 15%.

SOLUTION EXHIBIT 17-37B

Summarize the Total Costs to Account For, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory;
FIFO Method of Process Costing, Assembly Department of McKnight Handcraft for April 2014.

	Total Production Costs	**Direct Materials**		**Conversion Costs**
~~(**Step 3**) Work in process, beginning (given)~~	~~$ 1,686~~	~~$ 1,530~~		~~$ 156~~
Costs added in current period (given)	29,394	17,850		11,544
Total costs to account for	~~$31,080~~	~~$19,380~~		~~$11,700~~
(**Step 4**) Costs added in current period		~~$17,850~~		~~$11,544~~
Divide by equivalent units of work done in current period (Exhibit 17-37A)		÷ 510		÷ 444
Cost per equivalent unit of work done in current period		$ 35		$ 26
(**Step 5**) Assignment of costs:				
Completed and transferred out (455 units):				
Work in process, beginning (95 units)	$ 1,686	$1,530	+	$156
Costs added to begin. work in process in current period	936	(0* × $35)	+	(36* × $26)
Total from beginning inventory	2,622			
Started and completed (360 units)	23,790	(390† × $35)	+	(390† × $26)
Total costs of units completed & tsfd. out	26,412			
Work in process, ending (130 units)	4,668	(120# × $35)	+	(18# × $26)
Total costs accounted for	$31,080	$19,380	+	$11,700

*Equivalent units used to complete beginning work in process from Solution Exhibit 17-37A, Step 2.
†Equivalent units started and completed from Solution Exhibit 17-37A, Step 2.
#Equivalent units in ending work in process from Solution Exhibit 17-37A, Step 2.

17-38 (30 min.) **Transferred-in costs, weighted average.**

1. Solution Exhibit 17-38A computes the equivalent units of work done to date in the Binding Department for transferred-in costs, direct materials, and conversion costs.

Solution Exhibit 17-38B summarizes total Binding Department costs for April 2014, calculates the cost per equivalent unit of work done to date in the Binding Department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the weighted-average method.

2. Journal entries:

a.	Work in Process— Binding Department	155,520	
	Work in Process—Printing Department		155,520
	Cost of goods completed and transferred out during April from the Printing Department to the Binding Department		
b.	Finished Goods	264,708	
	Work in Process— Binding Department		264,708
	Cost of goods completed and transferred out during April from the Binding Department to Finished Goods inventory		

SOLUTION EXHIBIT 17-38A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Binding Department of Publishers, Inc., for April 2014.

	(Step 1)	(Step 2) Equivalent Units		
Flow of Production	**Physical Units**	**Transferred-in Costs**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	1,260			
Transferred-in during current period (given)	2,880			
To account for	4,140			
Completed and transferred out during current period:	3,240	3,240	3,240	3,240
Work in process, ending[a] (given)	900			
(900 × 100%; 900 × 0%; 900 × 70%)		900	0	630
Accounted for	4,140			
Equivalent units of work done to date		4,140	3,240	3,870

[a]Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 70%.

SOLUTION EXHIBIT 17-38B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Binding Department of Publishers, Inc., for April 2014.

		Total Production Costs	Transferred-in Costs	Direct Materials	Conversion Costs
~~**(Step 3)**~~	~~Work in process, beginning (given)~~	~~$ 55,440~~	~~$ 39,060~~	~~$ 0~~	~~$16,380~~
	Costs added in current period (given)	267,948	155,520	28,188	84,240
	Total costs to account for	$323,388	$194,580	$28,188	$100,620
(Step 4)	Costs incurred to date		$194,580	$28,188	$100,620
	Divide by equivalent units of work done to date (Solution Exhibit 17-38A)		÷ 4,140	÷ 3,240	÷ 3,870
	Cost per equivalent unit of work done to date		$ 47.00	$ 8.70	$ 26.00
(Step 5)	Assignment of costs:				
	Completed and transferred out (3,240 units)	$264,708	(3,240[a] × $47.00)	+ (3,240[a] × $8.70)	+ (3,240[a] × $26)
	Work in process, ending (900 units):	58,680	(900[b] × $47.00)	+ (0[b] × $8.70)	+ (630[b] × $26)
	Total costs accounted for	$323,388	$194,580	+ $28,188	+ $100,620

[a] Equivalent units completed and transferred out from Sol. Exhibit 17-38A, step 2.

[b] Equivalent units in ending work in process from Sol. Exhibit 17-38A, step 2.

17-39 (30 min.) **Transferred-in costs, FIFO method (continuation of 17-38).**

1. Solution Exhibit 17-39A calculates the equivalent units of work done in April 2014 in the Binding Department for transferred-in costs, direct materials, and conversion costs.

Solution Exhibit 17-39B summarizes total Binding Department costs for April 2014, calculates the cost per equivalent unit of work done in April 2014 in the Binding Department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the FIFO method.

Journal entries:

a.	Work in Process— Binding Department	149,760	
	Work in Process—Printing Department		149,760
	Cost of goods completed and transferred out during April from the Printing Department to the Binding Department.		
b.	Finished Goods	259,488	
	Work in Process— Binding Department		259,488
	Cost of goods completed and transferred out during April from the Binding Department to Finished Goods inventory.		

2. The equivalent units of work done in beginning inventory is as follows: Transferred-in costs, 1,260 × 100% = 1,260; direct materials, 1,260 × 0% = 0; and conversion costs, 1,260 × 50% = 630. The cost per equivalent unit of beginning inventory and of work done in the current period are

	Beginning Inventory	Work Done in Current Period
~~Transferred-in costs (weighted average)~~	~~$31.00 ($39,060 ÷ 1,260)~~	~~$54.00 ($155,520 ÷ 2,880)~~
Transferred-in costs (FIFO)	$35.00 ($44,100 ÷ 1,260)	$52.00 ($149,760 ÷ 2,880)
Direct materials	—	$ 8.70
Conversion costs	$26.00 ($16,380 ÷ 630)	$26.00

The following table summarizes the costs assigned to units completed and those still in process under the weighted-average and FIFO process-costing methods for the Binding Department.

	Weighted Average (Solution Exhibit 17-38B)	FIFO (Solution Exhibit 17-39B)	Difference
Cost of units completed and transferred out	$264,708	$259,488	–$5,220
Work in process, ending	58,680	63,180	+$4,500
Total costs accounted for	$323,388	$322,668	

The FIFO ending inventory is higher than the weighted-average ending inventory by $4,500. This is because FIFO assumes that all the lower-cost prior-period units in work in process (resulting from the lower transferred-in costs in beginning inventory) are the first to be completed and transferred out while ending work in process consists of only the higher-cost current-period units. The weighted-average method, however, smoothes out cost per equivalent unit by assuming that more of the higher-cost units are completed and transferred out, while some of the lower-cost units in beginning work in process are placed in ending work in process. Hence, in this case, the weighted-average method results in a higher cost of units completed and transferred out and a lower ending work-in-process inventory relative to FIFO. Note that the difference in cost of units completed and transferred out (–$5,220) does not exactly offset the difference in ending work-in-process inventory (+$4,500). This is because the FIFO and weighted-average methods result in different values for transferred-in costs with respect to both beginning inventory and costs transferred in during the period.

SOLUTION EXHIBIT 17-39A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Binding Department of Publishers, Inc., for April 2014.

	(Step 1)	(Step 2) Equivalent Units		
Flow of Production	**Physical Units**	**Transferred-in Costs**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	1,260	(work done before current period)		
Transferred-in during current period (given)	2,880			
To account for	4,140			
Completed and transferred out during current period:				
From beginning work in process[a]	1,260			
[1,260 ×(100% – 100%); 1,260 × (100% – 0%); 1,260 ×(100% – 50%)]		0	1,260	630
Started and completed	1,980[b]			
(1,980 ×100%; 1,980 ×100%; 1,980 ×100%)		1,980	1,980	1,980
Work in process, ending[c] (given)	900			
(900 ×100%; 900 x 0%; 900 ×70%)		900	0	630
Accounted for	4,140			
Equivalent units of work done in current period		2,880	3,240	3,240

[a] Degree of completion in this department: Transferred-in costs, 100%; direct materials, 0%; conversion costs, 50%.

[b] 3,240 physical units completed and transferred out minus 1,260 physical units completed and transferred out from beginning work-in-process inventory.

[c] Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 70%.

SOLUTION EXHIBIT 17-39B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Binding Department of Publishers, Inc., for April 2014.

		Total Production Costs	Transferred-in Costs		Direct Materials		Conversion Costs
(Step 3)	Work in process, beginning (given)	$ 60,480	$ 44,100		$ 0		$16,380
	Costs added in current period (given)	262,188	149,760		28,188		84,240
	Total costs to account for	$322,668	$193,860		$28,188		$100,620
(Step 4)	Costs added in current period		$149,760		$28,188		$84,240
	Divide by equivalent units of work done in current period (Sol. Exhibit 17-39A)		÷ 2,880		÷ 3,240		÷ 3,240
	Cost per equivalent unit of work done in current period		$ 52.00		$ 8.70		$ 26.00
(Step 5)	Assignment of costs:						
	Completed and transferred out (3,240 units)						
	Work in process, beginning (1,260 units)	$ 60,480	$44,100	+	$0	+	$16,380
	Costs added to beginning work in process in current period	27,342	(0[a] × $52)	+	(1,260[a] × $8.70)	+	(630[a] × $26)
	Total from beginning inventory	87,822					
	Started and completed (1,980 units)	171,666	(1,980[b] × $52)	+	(1,980[b] × $8.70)	+	(1,980[b] × $26)
	Total costs of units completed and transferred out	259,488					
	Work in process, ending (900 units):	63,180	(900[c] × $52)	+	(0[c] × $8.70)	+	(630[c] × $26)
	Total costs accounted for	$322,668	$193,860	+	$28,188	+	$100,620

[a] Equivalent units used to complete beginning work in process from Solution Exhibit 17-39A, step 2.
[b] Equivalent units started and completed from Solution Exhibit 17-39A, step 2.
[c] Equivalent units in ending work in process from Solution Exhibit 17-39A, step 2.

17-40 (45 min.) **Transferred-in costs, weighted-average and FIFO methods.**

1. Solution Exhibit 17-40A computes the equivalent units of work done to date in the fermenting department for transferred-in costs, direct materials, and conversion costs. Solution Exhibit 17-40B summarizes total fermenting department costs for July, calculates the cost per equivalent unit of work done to date in the fermenting department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the weighted-average method.

2. Solution Exhibit 17-40C computes the equivalent units of work done in July in the fermenting department for transferred-in costs, direct materials, and conversion costs. Solution Exhibit 17-40D summarizes total fermenting department costs for July, calculates the cost per equivalent unit of work done in July in the fermenting department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the FIFO method.

SOLUTION EXHIBIT 17-40A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Fermenting Department of Portland Pale Ale, Inc., for July.

	(Step 1)	(Step 2)		
		Equivalent Units		
Flow of Production	**Physical Units**	**Transferred-in Costs**	**Direct Materials**	**Conversion Costs**
Work in process, beginning (given)	2,500			
Transferred in during current period (given)	10,000			
To account for	12,500			
Completed and transferred out during current period	10,500	10,500	10,500	10,500
Work in process, ending* (given)	2,000			
2,000 × 100%; 2,000 × 0%; 2,000 × 50%		2,000	0	1,000
Accounted for	12,500			
Equivalent units of work done to date		12,500	10,500	11,500

*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 50%.

SOLUTION EXHIBIT 17-40B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Fermenting Department of Portland Pale Ale, Inc., for July.

		Total Production Costs	Transferred -in Costs	Direct Materials	Conversion Costs
(Step 3)	Work in process, beginning (given)	$153,500	$116,000	$ 0	$ 37,500
	Costs added in current period (given)	647,025	384,000	110,775	152,250
	Total costs to account for	$800,525	$500,000	$110,775	$189,750
(Step 4)	Costs incurred to date		$500,000	$110,775	$189,750
	Divide by equivalent units of work done to date (Solution Exhibit 17-40A)		÷ 12,500	÷ 10,500	÷ 11,500
	Equivalent unit costs of work done to date		$ 40.00	$ 10.55	$ 16.50
(Step 5)	Assignment of costs:				
	Completed and transferred out (10,500 units)	$704,025	(10,500[a] × $40.00)	+ (10,500[a] × $10.55)	+ (10,500[a] × $16.50)
	Work in process, ending (2,000 units)	96,500	(2,000[b] × $40.00)	+ (0[b] × $10.55)	+ (1,000[b] × $16.50)
	Total costs accounted for	$800,525	$500,000	+ $110,775	+ $189,750

[a] Equivalent units completed and transferred out from Solution Exhibit 17-40A, Step 2.
[b] Equivalent units in ending work in process from Solution Exhibit 17-40A, Step 2.

SOLUTION EXHIBIT 17-40C

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Fermenting Department of Portland Pale Ale, Inc., for July.

Flow of Production	(Step 1) Physical Units	(Step 2) Equivalent Units		
		Transferred-in Costs	Direct Materials	Conversion Costs
Work in process, beginning (given)	2,500	(work done before current period)		
Transferred-in during current period (given)	10,000			
To account for	12,500			
Completed and transferred out during current period:				
From beginning work in process[§]	2,500			
2,500 × (100% – 100%); 2,500 × (100% – 0%); 2,500 × (100% – 25%)		0	2,500	1,875
Started and completed	8,000[†]			
8,000 × 100%; 8,000 × 100%; 8,000 × 100%		8,000	8,000	8,000
Work in process, ending* (given)	2,000			
2,000 × 100%; 2,000 × 0%; 2,000 × 50%		2,000	0	1,000
Accounted for	10,800			
Equivalent units of work done in current period		10,000	10,500	10,875

[§]Degree of completion in this department: Transferred-in costs, 100%; direct materials, 0%; conversion costs, 25%.

[†]10,500 physical units completed and transferred out minus 2,500 physical units completed and transferred out from beginning work-in-process inventory.

*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 50%.

SOLUTION EXHIBIT 17-40D

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Fermenting Department of Portland Pale Ale, Inc., for July.

		Total Production Costs	Transferred -in Costs	Direct Materials	Conversion Costs
(Step 3)	Work in process, beginning (given)	$153,180	$115,680	$ 0	$ 37,500
	Costs added in current period (given)	639,025	376,000	110,775	152,250
	Total costs to account for	$792,205	$491,680	$110,775	$189,750
(Step 4)	Costs added in current period		$ 376,000	$110,775	$152,250
	Divide by equivalent units of work done in current period (Solution Exhibit 17-40C)		÷ 10,000	÷ 10,500	÷10,875
	Cost per equivalent unit of work done in current period		$ 37.60	$ 10.55	$ 14.00
(Step 5)	Assignment of costs:				
	Completed and transferred out (10,500 units):				
	Work in process, beginning (2,500 units)	$153,180	$115,680	+ $0	+ $37,500
	Costs added to beg. work in process in current period	52,625	(0^a × $37.60)	+ ($2,500^a$ × $10.55)	+ ($1,875^a$ × $14.00);
	Total from beginning inventory	205,805			
	Started and completed (8,000 units)	497,200	($8,000^b$ × $37.60)	+ ($8,000^b$ × $10.55)	+ ($8,000^b$ × $14.00)
	Total costs of units completed & transferred out	703,005			
	Work in process, ending (2,000 units)	89,200	($2,000^c$ × $37.60)	+ (0^c × $10.55)	+ ($1,000^c$ × $14.00);
	Total costs accounted for	$792,205	$491,680	+ $110,775	+ $189,750

[a] Equivalent units used to complete beginning work in process from Solution Exhibit 17-40C, Step 2.
[b] Equivalent units started and completed from Solution Exhibit 17-40C, Step 2.
[c] Equivalent units in ending work in process from Solution Exhibit 17-40C, Step 2

17-41 (25 min.) **Multiple processes or operations, costing.**

1. Conversion costs incurred in March = $68,850

   Equivalent units of work:

Units completed and transferred:	12,000 × 100% =	12,000
Units formed but not assembled:	4,000 × 60% =	2,400
Units assembled but not finished:	2,000 × 90% =	1,800
Total equivalent units:		16,200

   Conversion cost per equivalent unit = $68,850/16,200 = $4.25

2. Cost per equivalent unit for the three materials categories:

   Cullets: $\dfrac{\$67,500 - \$4,500}{12,000 + 4,000 + 2,000} = \dfrac{\$63,000}{18,000} = \$3.50$

   Silicone: $\dfrac{\$24,000 - \$3,000}{12,000 + 2,000} = \dfrac{\$21,000}{14,000} = \$1.50$

   Polypropylene: $\dfrac{\$6,000}{12,000} = = \$0.50$

3. Cost of 12,000 bottles completed and transferred:

   Materials: 12,000 × ($3.50 + $1.50 + $0.50) = $ 66,000

   Conversion costs: 12,000 × $4.25 = $ 51,000

   $117,000

4. Cost of 4,000 units formed but not assembled (i.e., at end of first operation):

   Materials (only cullets): 4,000 × $3.50 = $14,000

   Conversion costs: 4,000 × 60% × $4.25 = $10,200

   $24,200

5. Cost of 2,000 units assembled but not finished (i.e., at end of second operation):

   Materials (cullets and silicone): 2,000 × ($3.50 + $1.50) = $10,000

   Conversion costs: 2,000 × 90% × $4.25 = $ 7,650

   $17,650

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17-42 (20 min.) **Benchmarking, ethics.**

1. The reported monthly cost per equivalent unit of either direct materials or conversion costs is lower when the plant manager overestimates the percentage of completion of ending work in process; the overestimate increases the denominator and, thus, decreases the cost per equivalent unit. The plant manager has two motivations to report lower cost per equivalent unit numbers (1) to get a bonus and (2) to be recognized in the company newsletter.

2. Although the plant controller has responsibility for preparing the accounting reports for the plant, in most cases, the plant controller reports directly to the plant manager. If this reporting relationship exists, McNall may create a conflict of interest situation for the plant controller. Only if the plant controller reports directly to the corporate controller, and indirectly to the plant manager, should McNall show the letters to the plant controller without simultaneously showing them to the plant manager.

3. The plant controller's ethical responsibilities to McNall and to Scott Quarry are the same. These include:

- *Competence:* The plant controller is expected to have the competence to make equivalent unit computations. This competence does not always extend to making estimates of the percentage of completion of a product. In Scott Quarry's case, however, the products are probably easy to understand and observe. Hence, a plant controller could obtain reasonably reliable evidence on percentage of completion at a plant.
- *Objectivity:* The plant controller should not allow the possibility of the plant being written about favorably in the company newsletter to influence the way equivalent unit costs are computed. The plant controller has a responsibility to communicate information fairly and objectively.

4. McNall could seek evidence on possible manipulations as follows:

a. Have plant controllers report detailed breakdowns on the stages of production and then conduct end-of-month audits to verify the actual stages completed for ending work in process.
b. Examine trends in ending work in process. Divisions that report low amounts of ending work in process relative to total production are not likely to be able to greatly affect equivalent unit cost amounts by manipulating percentage of completion estimates. Divisions that show sizable quantities of total production in ending work in process are more likely to be able to manipulate equivalent cost computations by manipulating percentage of completion estimates.

17-43 (30 min.) **Standard-costing method.**

1. Because there was no additional work needed on the beginning inventory with respect to materials, the phones in inventory must have been 100% complete with respect to materials. For conversion costs, the work done to complete the opening inventory was 521,000 ÷ 1,158,000 = 45%. Therefore, the unfinished phones in opening inventory must have been 55% complete with respect to conversion costs.

2. It is clear that the ending WIP is also 100% complete with respect to direct materials (2,180,400 ÷ 2,180,400), and it is 60% (1,308,240 ÷ 2,180,400) complete with regard to conversion costs.

3. We can first obtain the total standard costs per unit. The number of units started and completed during August is 1,014,000, and a total cost of $8,061,300 is attached to them. The per unit standard cost is therefore ($8,061,300 ÷ 1,014,000) = $7.95. If x and y represent the per unit cost for direct materials and conversion costs, respectively, we know that:

$$x + y = 7.95$$

We also know that the ending inventory is costed at $14,630,484 and contains 2,180,400 equivalent units of materials and 1,308,240 equivalent units of conversion costs. This provides a second equation:

$$2{,}180{,}400\,x + 1{,}308{,}240\,y = 14{,}630{,}484.$$

Solving these two equations reveals that the direct materials cost per unit, x, is $4.85, while the conversion cost per unit, y, is $3.10.

4. The opening WIP inventory contained 1,158,000 equivalent units of materials and (1,158,000 – 521,100) = 636,900 equivalent units of conversion costs. Applying the standard costs computed in step (3), the cost of the opening inventory must have been:

$$(1{,}158{,}000 \times \$4.85) + (636{,}900 \times \$3.10) = \$7{,}590{,}690.$$