PROCESS COSTING
FIRST-IN FIRST-OUT METHOD

Key Terms and Concepts to Know

Differences between Job-Order Costing and Processing Costing

- Process costing is used when a single product is made on a continuous basis. The units produced are identical. Job order costing is used when different jobs are worked each period.
- Process costing accumulates manufacturing costs (raw material, direct labor and manufacturing overhead) by processing department. Job-order costing accumulates manufacturing costs by job.
- In process costing, unit costs are computed by department. In job-order costing, unit costs are computed by job.

The Flow of Materials, Labor, and Overhead Costs

- In process costing, the flow of costs through raw materials, work-in-process, finished goods and cost of goods sold accounts is the same as for job order costing.
- The manufacturing overhead account is used in the same manner as for job order costing.
- However, since process costing accumulates manufacturing costs by department, each department requires a separate work-in-process account and a separate manufacturing overhead account.
- Direct labor and manufacturing overhead are often combined into Conversion Costs. This can be done ONLY when the percent complete is the same for both costs. For example, if overhead is applied using direct labor hours, then the percent complete may be the same. If overhead is applied on the basis of machine hours or direct materials used, then the percent complete would probably not be the same.

Process Costing Methods

- The first-in, first-out method of assigning costs to inventory approximates the actual physical flow of units through the inventory accounts when inventory is perishable or has a short demand cycle such as fashion clothing.
    - It has the advantage of keeping the production costs incurred in each period separate from all other periods.

  - It assumes that the units in beginning work in process inventory are completed first, followed by the units started into production during the period.
  - Units started in the prior period and completed in the current period are assigned costs from both periods: the costs assigned to the partially completed units in the prior period plus the costs to compete production from the current period.
  - Units started and completed during the current period are assigned costs from only the current period.
  - Units started in the current period and not completed at the end of the period are assigned costs from only the current period.
- The weighted average method of assigning costs to inventory sometimes approximates the actual physical flow of units through the inventory accounts.
  - It combines the production costs assigned to beginning work in process with the costs incurred during the current period to calculate a weighted average cost per unit.
  - It assumes that the units in beginning work in process inventory and the units started into production during the period are equally likely to be completed during the period.
  - All units completed during the current period are assigned costs based on the weighted average cost per unit.
  - Units started in the current period and not completed at the end of the period are assigned costs based on the weighted average cost per unit.

Equivalent Units of Production - FIFO

- At the beginning of most accounting periods, there is a balance in work-in-process inventory. When these units are completed in the current period, they will be assigned current period costs in proportion to how complete they are with respect to each of direct materials, direct labor and manufacturing overhead.
- To simplify the calculations, partially completed units are converted into equivalent whole units for each type of cost. For example, if there are six units in process at the end of the period and one-third of the direct materials needed for a complete unit have been added to each unit, then the six incomplete units are the equivalent of two complete units of direct materials.
- Units completed and transferred out of work in process are always 100% complete for all types of costs.
- For each type of cost: direct materials, direct labor and manufacturing overhead, FIFO equivalent units are the sum of the equivalent units necessary to complete beginning inventory, the equivalent units started and completed during the period and the equivalent units for units started and not completed at period end.

Key Topics to Know

Process costing is accounted for in five separate steps:

- Step 1: Prepare a schedule summarizing the physical flow of units through the work in process account.
- Step 2: Calculate equivalent units to complete the units in beginning work in process inventory, units started and completed during the period and units in ending work-in-process inventory.
- Step 3: Determine the costs assigned to beginning inventory and keep them separate from the costs incurred during the period for direct materials, direct labor and overhead.
- Step 4: Using only the current period costs, calculate the cost per equivalent unit for each type of cost.
- Step 5: Assign costs to the units completed from beginning inventory, units, completed and transferred to the next department and the units remaining in ending work-in-process inventory.

Often the steps are combined into a single report, the Production Report.

- The advantage of such a report is the ability to see process costing as a continuous flow of information and how the four steps relate to one another.
- The disadvantage is that the separate discrete steps become blended into a single report.

In process costing, the flow of costs through the work-in-process accounts follows the flow of units being produced through the manufacturing departments. When the units are completed in one department and transferred to the next department, the costs incurred to date for those units are transferred to the next department's work-in-process inventory account. Each processing department maintains a separate work-in-process account and prepares separate process costing accounting.

Materials, labor, and/or manufacturing overhead can be added in any processing department. Transferred in costs are accounting for as direct materials, direct labor and overhead. Units are always 100% complete for transferred in costs.

Following are typical journal entries to record the flow costs through the inventory accounts into cost of goods sold:

<u>Materials Costs</u>		
Work in Process – Department A	xxx	
Raw Materials		xxx

Labor Costs		
Work in Process – Department A	xxx	
Salaries and Wages Payable		xxx
Manufacturing Overhead Costs		
Work in Process – Department A	xxx	
Manufacturing Overhead		xxx
Completion and Transferring		
Work in Process – Department B	xxx	
Work in Process – Department A		xxx
Finished Goods	xxx	
Work in Process – Department B		xxx
Cost of Goods Sold		
Cost of Goods Sold	xxx	
Finished Goods		xxx

Equivalent Units, Costs and Cost Assignment

- The steps listed above are combined into a single production report shown below.
- Again, note the hallmarks of the FIFO method:
  - Units in beginning inventory are kept separate from units started during the period.
  - Costs in beginning inventory are kept separate from costs incurred during the period.
  - Units in beginning inventory are completed first and are added to the units started and completed during the period to determine the total units completed.
  - Costs per equivalent unit are based on costs incurred during the period.
  - As with any process costing system, units to be accounted for = units accounted for and costs to be assigned = costs assigned.

	Physical Units	*STEP 2: Equivalent Units*		
		Materials	Labor	Overhead
STEP 1: Work in Process Units				
Beginning balance				
+ Started into production				
= Units to be Accounted For				
Completed and Transferred Out:				
From beginning inventory				
Started during the period				
Subtotal				
+ Ending balance				
= Units Accounted For				

	Total
STEP 3: Costs Incurred	
Beginning balance	
+ Costs added during the period	
= Costs to be Accounted For	
STEP 4: Cost per Equivalent Unit:	
Costs added during the period	
Equivalent units	
STEP 5: Costs Assigned	
Completed and Transferred Out	
From beginning inventory	
Started during the period	
Subtotal	
+ Ending balance	
= Costs Accounted For	

- *Step 1*: Analyze the flow of physical units through the work-in-process inventory account. Units to be accounted for (inflows) must equal Units accounted for (outflows).

- *Step 2*: Calculate equivalent units only for Units Completed and Transferred Out and Ending Balance in Work-In-Process. Multiply physical units by percent complete for each cost column (materials, labor and overhead) for each line and total equivalent units for each cost column.
- *Step 3*: Total costs in beginning inventory and costs added during the period for each cost column (materials, labor and overhead) and in total.
- *Step 4*: For each cost column (materials, labor and overhead), divide total costs from Step 2A by total equivalent units from Step 2 to compute cost per equivalent unit.
- *Step 5*: For Completed and Transferred Out, multiply equivalent units from Step 2 by cost per equivalent unit from Step 2B for each cost column (materials, labor and overhead). For Ending Balance, multiply equivalent units from Step 2 by cost per equivalent unit from Step 2B for each cost column (materials, labor and overhead). Total costs assigned in each cost column and the total column. Total costs to be assigned in Step 2A must equal total costs assigned in Step 3.
- Note that labor and overhead may be combined as conversion cost only if the percent complete is the same.

Example #1

M Company produces house paint in two processing departments: the Mixing Department that mixes the paint colors and the Finishing Department that puts the paint in containers and labels them. The following information related to the company's operation for October follows:

a) Raw materials were issued for use in production: Mixing department, $638,750, and the Finishing department, $629,000.
b) Direct labor costs incurred: Mixing department $270,000, and Finishing department $230,000.
c) Manufacturing overhead cost applied: Mixing department $665,000, and Finishing department, $405,000.
d) The cost of the mixed paint transferred from the Mixing department to the Finishing department has yet to be determined.
e) Paint that had been prepared for shipping was transferred from the Finishing department to Finished Goods. Cost of the transferred paint was $3,200,000.

Required: Prepare journal entries to record items a) through e) above

Solution #1

a)	Work in Process – Mixing	638,750	
	Work in Process – Finishing	629,000	
	Raw Materials		1,267,750
b)	Work in Process – Mixing	270,000	
	Work in Process – Finishing	230,000	
	Wages and Salaries Payable		500,000
c)	Work in Process – Mixing	665,000	
	Work in Process – Finishing	405,000	
	Manufacturing Overhead		1,070,000
d)	Work in Process – Finishing	?	
	Work in Process – Mixing		?
e)	Finished Goods	3,200,000	
	Work in Process – Finishing		3,200,000

Example #2

M Company uses a processing costing system. The following data are available for the mixing department for October. The department started 175,000 gallons into production during the month.

		Percent Complete	
			Conversion
	Gallons	Materials	Costs
Work-in-process, October 1	30,000	65%	30%
Work-in-process, October 31	15,000	80%	40%

Required: Determine the equivalent units of production for the month.

Solution #2

		Equivalent Units	
	Gallons	Materials	Conversion Cost
Work-in-process, October 1	30,000		
Started into production	175,000		
Units to be Accounted For	205,000		
Completed and Transferred:			
From beginning inventory	30,000	10,500	21,000
Started during the period	160,000	160,000	160,000
Subtotal	190,000	170,500	181,000
Work-in-process, October 31	15,000	12,000	6,000
Units Accounted For	205,000	182,500	187,000

Example #3

M Company's September 30th general ledger showed a balance of $634,500 in work-in-process inventory. $206,500 of the balance was direct materials.

Required: Compute total costs to be accounted for and the costs per equivalent unit in the Mixing Department using the data and solutions from Examples #1 and #2.

Solution #3:

	Total	Materials	Conversion Cost
Beginning balance	$634,500	$206,500	$428,000
+ Costs added during the period	1,573,750	638,750	270,000 665,000
= Costs to be Accounted For	$2,208,250	$845,250	$1,363,000
Costs added during the period	$1,573,750	$638,750	$935,000
Divided by: Equivalent units	205,000	182,500	187,000
= Cost per Equivalent Unit		$3.50	$5.00

Example #4

M Company must assign the manufacturing costs in work-in-process inventory at the end of October to the gallons finished and ready for sale and the gallons still in process at October 31.

Required: Using the data and solutions from Examples #1, #2 and #3, compute the ending balance in work-in-process inventory for the Mixing department and the cost of gallons transferred to the Finishing department during October.

Solution #4

	Total	Materials	Conversion Cost
Completed and Transferred:			
	$634,500	$206,500	$428,000
From beginning inventory	$141,750	10,500 x $3.50 = $36,750	21,000 x $5.00 = $105,000
Started during the period	$1,360,000	160,000 x $3.50 = $560,000	160,000 x $5.00 = $800,000
Subtotal	$2,136,250	$803,250	$1,333,000
Work-in-process, October 31	$72,000	12,000 x $3.50 = $42,000	6,000 x $5.00 = $30,000
Units Accounted For	$2,208,250	$845,250	$1,363,000

Example #5

M Company must transfer the costs of completed gallons of house paint from the Mixing Department to the Finishing Department at month end.

Required: Prepare journal entry to record this transaction

Solution #5

Work in Process – Finishing	2,136,750	
Work in Process – Mixing		2,136,750

Practice Problems

Practice Problem #1

S Company uses a process cost system. The Molding Department adds materials at the beginning of the process and conversion costs are incurred uniformly throughout the process. Work in process on May 1 was 75% complete and work in process on May 31 was 25% complete.

	Physical Units	Total Costs	Materials	Conversion
Beginning balance	16,000		$41,000	$42,000
Started into production	50,000	$250,600		
Completed and Transferred Out	46,000			
Total Costs			$198,000	

Required: Complete the production report for the Molding Department for May.

Practice Problem #2

The finishing department had 5,000 incomplete units in its beginning Work-in-Process Inventory which were 100% complete as to materials and 30% complete as to conversion costs. 15,000 units were received from the previous department. The ending Work-in-Process Inventory consisted of 2,000 units that were 50% complete as to materials and 30% complete as to conversion costs. The Finishing Department uses first-in, first-out (FIFO) process costing.

Required:
a) How many units were transferred-out during the period?
b) How many units were started and completed during the period?
c) What are the equivalent units of production for the conversion costs during the period?

Practice Problem #3

M Corporation uses the FIFO method in its process costing system. Operating data for the Casting Department for the month of September appear below:

	Units	% Complete Conversion Cost
Beginning work in process inventory	15,000	20%
Transferred in from prior department	89,000	
Ending work in process inventory	24,000	90%

According to the company's records, the conversion cost in beginning work-in-process inventory was $15,660 at the beginning of September. Additional conversion costs of $526,524 were incurred in the department during the month.

Required:
a) What would be the cost per equivalent unit for conversion costs for September?
b) What is the amount of conversion costs transferred out?
c) What is the amount of conversion costs in ending inventory?

True / False Questions

1. Process cost systems are used to apply costs to a specific job, such as the manufacturing of a specialized machine.
   True False

2. In a process cost system, materials, labor and overhead are only added in the first production department.
   True False

3. Equivalent units of production is the sum of units completed and transferred out plus equivalent units of beginning work in process.
   True False

4. Physical units are another name for the equivalent units of production.
   True False

5. Process costing data is used by management to analyze production quantity and cost data for a particular job.
   True False

6. Equivalent units of production measure the work done during a period, expressed in fully completed units.
   True False

7. The total manufacturing cost per unit is used in costing the units completed and transferred during the period.
   True False

8. First-in, first-out (FIFO) process costing transfers out the costs in beginning inventory before transferring out the costs for units started and completed.
   True False

9. In general, the ending Work-in-Process Inventory value computed using first-in, first-out (FIFO) will be the same as the ending value computed using weighted-average process costing.
   True False

10. The percent complete associated with *prior department costs* is always 100%.
    True False

Multiple Choice Questions

1. In order to compute equivalent units of production using the FIFO method of process costing, work for the period must be broken down to units:
   a) completed during the period and units in ending inventory.
   b) started during the period and units transferred out during the period.
   c) completed from beginning inventory, started and completed during the month, and units in ending inventory.
   d) processed during the period and units completed during the period.

2. If beginning work in process is 2,000 units, ending work in process is 1,000 units, and the units accounted for equals 5,000 units, what are the units started into production?
   a) 7,000
   b) 6,000
   c) 3,000
   d) 4,000

3. S Company had the following department information about physical units and percentage of completion:

	Physical Units
Work in process, May 1 (60%)	36,000
Completed and transferred out	90,000
Work in process, May 31 (40%)	30,000

   If materials are added at the beginning of the production process, what is the total number of equivalent units for materials during May?
   a) 66,000
   b) 84,000
   c) 120,000
   d) 102,000

4. Which of the following would *not* appear as a debit in the Work in Process account of a second department in a two-stage production process?
   a) Materials used
   b) Overhead applied
   c) Labor assigned
   d) Cost of products transferred out

5. One characteristic of products that are mass-produced in a continuous production process is that
   a) The products are identical or very similar in nature.
   b) They are grouped in batches.
   c) They are produced at the time an order is received.
   d) Their costs are accumulated on job cost sheets.

6. Which of the following would appear as a credit in the Work in Process account of a second department in a two-stage production process?
   a) Materials used
   b) Overhead applied
   c) Labor assigned
   d) Cost of products transferred out

The next 3 questions refer to the following information.
In the month of June, department X had 10,000 units in beginning work in process that were 70% complete. During June, 40,000 units were transferred into production from another department. At the end of June, there were 5,000 units in ending work in process that were 40% complete. Materials are added at the beginning of the process, while conversion costs are incurred uniformly throughout the process

7. How many units were transferred out of the process in June?
   a) 40,000 units
   b) 35,000 units
   c) 45,000 units
   d) 50,000 units

8. The equivalent units of production for materials for June were
   a) 45,000 units
   b) 50,000 units
   c) 52,000 units
   d) 40,000 units

9. The equivalent units of production for conversion costs for June were
   a) 40,000 units
   b) 47,000 units
   c) 45,000 units
   d) 50,000 units

10. Which of the following statements regarding first-in, first-out (FIFO) process costing is (are) true?
(A) First-in, first-out (FIFO) process costing transfers out the costs in beginning inventory before transferring out the costs associated with units started and completed.
(B) First-in, first-out process costing requires a cost per equivalent unit in assigning costs to the units transferred out and the ending Work-in-Process Inventory.
a) Only A is true.
b) Only B is true.
c) Both A and B are true.
d) Neither A nor B is true.

11. In computing the current period's manufacturing cost per equivalent unit, the FIFO method of process costing considers:
a) Only current period costs.
b) Current period costs plus cost of beginning work-in-process inventory.
c) Current period costs less cost of beginning work-in-process inventory.
d) Current period costs plus the cost of ending work-in-process inventory.

12. If equivalent units are 6,000 for conversion costs and units transferred out equals 4,000, what stage of completion should the ending work in process be for the 8,000 units remaining?
a) 75%
b) 25%
c) 10%
d) 20%

13. In a process costing system:
a) A Work in Process account is maintained for each product.
b) A materials requisition identifies the job on which the materials will be used.
c) A Work in Process account is maintained for each process.
d) One Work in Process account is maintained for all manufacturing processes.

14. B Company has the following production information available for June:

Total materials costs	$ 80,000
Equivalent units of materials	10,000
Total conversion costs	$120,000
Equivalent units of conversion costs	20,000

What is the total manufacturing cost per unit?

a) $14.00
b) $6.67
c) $6.00
d) $8.00

15. The computation of equivalent units under the FIFO method:

a) Treats units in the beginning work-in-process inventory as if they were started and completed during the current period.
b) Treats units in the beginning work-in-process inventory as if they represent a batch of goods separate and distinct from goods started and completed during the current period.
c) Treats units in the ending work-in-process inventory as if they were started and completed during the current period.
d) Ignores units in the beginning and ending work-in-process inventories.

Solutions to Practice Problems

Practice Problem #1

	Physical Units		
Beginning balance	16,000		
+ Started into production	50,000		
= Units to be Accounted For	66,000		
		Materials	Conversion
Completed and Transferred Out:			
From beginning inventory	16,000	0	4,000
Started during the period	30,000	30,000	30,000
Subtotal	46,000	30,000	34,000
+ Ending balance	20,000	20,000	5,000
= Units Accounted For	66,000	50,000	39,000

	Total		
Beginning balance	$83,000	$41,000	$42,000
+ Costs added during the period	250,600	157,000	93,600
= Costs to be Accounted For	$333,600	$198,000	$135,600

Cost per equivalent unit		$157,000	$93,600
Costs added during the period		50,000 =	39,000 =
Equivalent units		$3.14	$2.40

Completed and Transferred Out			
From beginning inventory	$83,000	$41,000	$42,000
	9,600	0	9,600
Started during the period	166,200	94,200	72,000
Subtotal	$258,800	$135,200	$123,600
+ Ending balance	74,800	62,800	12,000
= Costs Accounted For	$333,600	$198,000	$135,600

Practice Problem #2

	Physical Units		
Beginning balance	5,000		
+ Started into production	15,000		
= Units to be Accounted For	20,000		
		Materials	Conversion
Completed and Transferred Out:			
From beginning inventory	5,000	0	3,500
Started during the period	13,000	13,000	13,000
Subtotal	18,000	13,000	16,500
+ Ending balance	2,000	1,000	600
= Units Accounted For	20,000	14,000	17,100

Practice Problem #3

	Physical Units		
Beginning balance	15,000		
+ Started into production	89,000		
= Units to be Accounted For	104,000		
		Materials	Conversion
Completed and Transferred Out:			
From beginning inventory	15,000		12,000
Started during the period	65,000		65,000
Subtotal	80,000		77,000
+ Ending balance	24,000		21,600
= Units Accounted For	104,000		98,600

	Total	
Beginning balance	$15,660	$15,660
+ Costs added during the period	526,524	526,524
= Costs to be Accounted For	$542,184	$542,184

Cost per equivalent unit	
Costs added during the period / Equivalent units	$5.34

Completed and Transferred Out		
From beginning inventory	$15,660	$15,660
	64,080	64,080
Started during the period	347,100	347,100
Subtotal	$426,840	$426,840
+ Ending balance	115,344	115,344
= Costs Accounted For	$542,184	$542,184

Solutions to True / False Problems

1. False - Process costing focuses on accumulating quantities and costs by production department, not production jobs.
2. False - Materials, labor and/or overhead may be added at any point during the production process.
3. False - Equivalent units is the sum of equivalent units to complete beginning work in process plus units started and completed plus equivalent units for ending work in process.
4. False - Physical units are the actual units being produced whereas equivalent units are an accounting convenience to eliminate partially completed units.
5. False – Process costing reports quantity and cost data for a particular production department.
6. True
7. True
8. True
9. False – the two methods will probably produce different values for ending work in process.
10. True

Solutions to Multiple Choice Questions

1. C
2. C
3. B
4. D
5. A
6. D
7. C
8. D
9. A
10. C
11. A
12. B
13. C
14. A
15. B