Fundamentals of Cost Accounting 3rd Edition Lanen Solutions Manual
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11
Service Department and Joint Cost Allocation

Solutions to Review Questions

11-1.

Companies allocate costs to estimate or assess the costs of their activities (products, processes, etc.). It is an estimate and subject to the problem that cost allocation contains an arbitrary element. Not allocating costs, however, is also an estimate—an estimate of zero. This may be appropriate for some decisions, but not for others.

Some of the disadvantages (costs) include:

(1) Additional bookkeeping;

(2) Additional management costs in selecting allocation methods and allocation bases;

(3) Costs of making the wrong decision if the allocations provide misleading information.

Some of the advantages (benefits) of cost allocation include:

(1) Instilling responsibility for all costs of the company in the division managers;

(2) Relating indirect costs to contracts, jobs and products;

(3) Constructing performance measures (“net profit”) for a division that may be more meaningful to management than contribution margins.

11-2.

The essential difference is the allocation of costs among service departments. The direct method makes no inter-service-department allocation, the step method makes a partial inter-service-department allocation, while the reciprocal solution method fully recognizes inter-service-department activities. All three methods allocate costs to the production departments based on the production department’s relative use.

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11-3.

Allocations usually begin from the service department that has provided the greatest proportion of its services to other service departments, or that services the greatest number of other service departments. This criterion is used to minimize the unrecognized portion of reciprocal service department costs. (Recall that the amount of service received by the first department to allocate in the step allocation sequence is ignored.)

Another criterion employed is the amount of cost incurred by the service department. As with other allocation problems, it is a combination of the diversity (the proportion of resources used by other service departments) and the costs involved that are important in making this choice.

11-4.

Joint cost allocations are usually made to assign a cost to a product after the split-off point. This is usually done for external reporting, tax, or rate-making purposes or to satisfy contract requirements. Because the joint costs are common to the outputs, it is not possible to find a direct way of relating the costs. Rather, the costs are related to economic benefits on the basis of some measure of relative outputs.

11-5.

Because net realizable values of the output provide a measure of the economic benefit received from each output from the production process, this method is usually preferred when it can be implemented. Further, the physical quantities may be difficult to compare (e.g., weights versus volumes).

11-6.

It could be preferable to use a physical quantities measure if it reflects the economic benefit ultimately obtainable from the production process, particularly if there is no objective selling price for joint products. Some examples include public utility rate setting, energy price regulation, new market setting, and new product price setting. In all of these cases, it is not possible to use the relative sales value method. Of course, the physical quantity measure used must make sense. Thus, ounces of lead should not be added to ounces of silver for joint cost allocation purposes.

11-7.

For joint products, costs of the inputs up to the split-off point are allocated to each of the products. Costs prior to split-off are not allocated to by-products in the same way as to the main (joint) products. Either joint costs (costs incurred prior to split-off) equal to the sales value of the by-product are allocated to the by-product, reducing the costs allocated to the main products (Method 1 in the text) or no joint costs are allocated to the by-product and it is credited with its sales value (Method 2).

11-8.

The joint costs of the product are irrelevant to this decision. Using the principle of differential costs, the joint costs are not differential in this decision. They are sunk costs, because they must be incurred under either decision.

Solutions to Critical Analysis and Discussion Questions

11-9.

Management might believe there are benefits to the use of allocated costs. An awareness of total costs may influence managerial behavior and decision making. For example, management might want to make division managers aware of common costs of divisions that must be covered by division margins before the company as a whole earns a profit.

Allocated costs are also used for contractual and regulatory purposes. Many of the exact reasons for the continued use of information based on allocated costs are still unknown. However, its widespread usage by management would indicate the information is beneficial.

11-10.

Allocating zero costs is another allocation method. It, too, is an arbitrary method. However, an advantage of not allocating costs is that the time saved reduces the expenses of cost allocation. A disadvantage is that common costs must be covered before the company as a whole earns a profit. Cost allocation can make managers more aware of common costs affecting long-run profitability.

11-11.

As with all cost allocation methods, there is a cost-benefit trade-off to be made. If the allocations using the reciprocal method are similar to the allocations using the direct or step method, it may not be worth using the reciprocal method. The costs are not simply computation costs, which are relatively small. The method has to be documented and explained so managers believe that the results are useful for decision-making.

11-12.

The concepts of direct and indirect are related to a specific cost object within the organization. Costs that can be attributed to a cost object and can, in both a physical and practical sense, be related to the cost object with no intermediate allocations are considered direct. Thus, at the first stage, the costs of supplies can be directly identified with the department that requisitioned them and used them in production. However, the costs of the purchasing department, which represents a service used by many different departments, cannot be traced directly to a product, or to a specific manufacturing department. At the second stage, the supplies are an indirect cost, because they cannot be identified with a specific cost object.

11-13.

The reciprocal method takes into account all of the services rendered among the service departments. It is preferred (assuming cost-effectiveness) because it results in an allocation scheme that reflects the total cost of the use of each service.

11-14.

If no service department performs services for any other service department (or if all service departments render services to producing departments in the same proportions) then the direct method will give the same answer as any other allocation method.

11-15.

The addition of an employee in one department will increase the allocation base and, therefore, reduce the allocation to the department that does not add the employee. The manager of the department that does not add the employee benefits from the actions of the other department. An example may serve to highlight the point. If each producing department has one employee and service department costs total $24,000, then the allocation would be: To P1: 1 employee x ($24,000 ÷ 2 employees) = $12,000. This would be the same as the allocation to P2. Now if P1 adds an employee, the allocation would be:

P1 2 employees x ($24,000 ÷ 3 employees) = $16,000

P2 1 employee x ($24,000 ÷ 3 employees) = $8,000

and the manager in P2 has a $4,000 cost reduction even though the manager of P2 took no action that would warrant such a reduction in costs. One of the problems that may give rise to this situation is that the costs allocated do not bear a relationship to the allocation base. Thus, if the number of employees were an appropriate allocation base, one would not expect the total cost to remain fixed when the number of employees increases. In practice, though, it may not be possible to obtain correlation between a cost and the allocation base.

11-16.

Answers will vary. Before deciding to outsource a service department, a company would want to consider some of the following. (1) Will the quality of service be the same? Quality includes many things including accuracy, timeliness, and customer service (where the customers are the other service departments and the production departments. (2) Will company information (for example, pay data) be secure with an outside vendor? (3) Will the company lose control over critical services by relying on an outside vendor?

11-17.

Answers will vary. First, it is useful to consider whether there are any reciprocal services. Both the Library and Career Development make use of Computer Support, but Computer Support probably uses little or no service from the other two. This suggests a step method might be appropriate. It is more difficult to determine the appropriate allocation base. The number of students is one choice, but executive education students make little or no use of Career Development. The number of students that use Career Development (measured, perhaps, by interviews) is a better choice for Career Development. Records of Library use are often difficult to collect, but again, students in the three programs will make different demands on the Library. Computer support might best be allocated by number of students.

The point of this question is that it is difficult to identify good allocation bases, but business school deans, as other managers, have to make decisions, and good cost information helps.

11-18.

Some managers use fully allocated cost numbers for long-run pricing and other long-run decisions. Allocated joint costs are used to compute the costs of department and divisional activities. These costs can be a factor in evaluating managerial performance, as we discuss in chapter 12. Joint cost allocations often arise as an issue in lawsuits in which opposing parties have the rights to earnings of joint products.

11-19.

The two situations are similar in that the conceptual treatment of the allocation problem is the same: the costs cannot be separately identified for each department or product; therefore, an allocation method must be chosen which reflects to the best possible extent a matching of the costs incurred with the benefits received. The resulting allocated costs must be used with care, if at all, in any decision-making context.

11-20.

Examples include timber, livestock, petroleum, real estate development (produces lots), railroad (many cars on the same train), and many other processing industries.

Solutions to Exercises

11-21. (15 min.) Why Costs Are Allocated—Ethical Issues: Giga-Corp.

a. The president of Stable Division would probably prefer to allocate Personnel costs on turnover. You could argue that turnover represents the use of Personnel and Personnel resources.

b. Ligia might argue that the cost of Personnel should be allocated on the basis of number of employees, because Personnel costs are incurred to provide the *capability* to handle turnover.

c. Notice that the view of the "correct" allocation method depends on where you sit. Next year, your arguments in (a) might seem to be "incorrect."

d. If you recommend different allocation bases depending on which division you will be heading, you cannot be basing your recommendation solely on what you believe to be the best one for assigning cost. Whether or not this is ethical, it will lessen your credibility.

11-22. (20 min.) Cost Allocations—Direct Method: Warren, Ltd.

Direct Method:

	To	
	Building A	Building B
Maintenance	$250,000[a]	$150,000
Cafeteria	160,000[b]	160,000
Total Costs	$410,000	$310,000

[a] $250,000 $= \frac{0.5}{0.5 + 0.3} \times \$400,000$

[b] $\$160,000 = \frac{0.1}{0.1 + 0.1} \times \$320,000$

(Note that the use of Maintenance's costs by Cafeteria and the use of Cafeteria costs by Maintenance are ignored.)

11-23. (30 min.) Allocating Service Department Costs First to Production Departments, Then to Jobs: Warren, Ltd.

	Building A	Building B	Total
Costs allocated to each department (from Exercise 11.22)	$410,000	$310,000	$720,000
Allocation bases:			
Job RW-12: Labor-hours	160	–0–	
Machine-hours	–0–	40	
Job RW-13: Labor-hours	20	–0–	
Machine-hours	–0–	180	
Total	180	220	

Department rates:

Building A .....$410,000 ÷ 180 labor-hours = $2,277.78 per labor-hour

Building B .....$310,000 ÷ 220 machine-hours = $1,409.09 per machine-*hour

Costs assigned to jobs*:

Job RW-12: Building A	160 x $2,277.78=	$ 364,444
Building B	40 x $1,409.09=	56,364
		$ 420,808
Job RW-13: Building A	20 x $2,277.78 =	$ 45,556
Building B	180 x $1,409.09=	253,636
Total		$ 299,192

* Adjusted for rounding difference.

Note: The total costs allocated to jobs equals $720,000 (= $420,808 + $299,192).

11-24. (15 min.) Cost Allocations–Direct Method: University Printers

	Maintenance	Personnel	Printing	Developing
Service department costs.....	$15,000	$36,000	–0–	–0–
Maintenance allocation[a]..	(15,000)	NA	$3,750	$ 11,250
Personnel allocation[b]	NA	(36,000)	7,200	28,800
Total costs allocated	$ –0–	$ –0–	$10,950	$40,050

[a]

$$\$\ 3{,}750 = \frac{1{,}000}{(1{,}000 + 3{,}000)} \times \$15{,}000$$

$$\$\ 11{,}250 = \frac{3{,}000}{(1{,}000 + 3{,}000)} \times \$15{,}000$$

[b]

$$\$\ 7{,}200 = \frac{500}{(500 + 2{,}000)} \times \$36{,}000$$

$$\$28{,}800 = \frac{2{,}000}{(500 + 2{,}000)} \times \$36{,}000$$

11-25. (25 min.) Cost Allocations—Step Method: Warren, Ltd.

a. Step Method—Maintenance First:

	To			
From	Maintenance	Cafeteria	Building A	Building B
Service department costs..	$400,000	$320,000		
Maintenance[a]	(400,000)	80,000	$200,000	$120,000
Cafeteria[b]	_____	(400,000)	200,000	200,000
Total Costs	$ –0–	$ –0–	$400,000	$320,000

[a] $80,000 = 20% x $400,000; $200,000 = 50% x $400,000;
$120,000 = 30% x $400,000

[b] $400,000 = $320,000 direct costs + $80,000 from Maintenance

$$\$200,000 = \frac{0.1}{(0.1 + 0.1)} \times \$400,000$$

$$\$200,000 = \frac{0.1}{(0.1 + 0.1)} \times \$400,000$$

b. Step Method—reverse order:

	To			
From	Cafeteria	Maintenance	Building A	Building B
Service department costs..	$320,000	$400,000		
Cafeteria[a]	(320,000)	256,000	$ 32,000	$ 32,000
Maintenance[b]	_____	(656,000)	410,000	246,000
Total Costs	$ –0–	$ –0–	$442,000	$278,000

[a] $256,000 = 80% x $320,000; $32,000 = 10% x $320,000; $32,000 = 10% x $320,000

[b] $656,000 = $400,000 direct costs + $256,000 from Cafeteria

$$\$410,000 = \frac{0.5}{(0.5 + 0.3)} \times \$656,000$$

$$\$246,000 = \frac{0.3}{(0.5 + 0.3)} \times \$656,000$$

11-26. (20 min.) Cost Allocation—Step Method: University Printers

	Maintenance	Personnel	Printing	Developing
Service department costs....	$ 15,000	$36,000	NA	NA
Maintenance[a].....	(15,000)	3,000	$3,000	$ 9,000
Personnel[b]		(39,000)	7,800	31,200
Total costs allocated	$ –0–	$ –0–	$10,800	$40,200

[a] $\$3{,}000 = \frac{1{,}000}{(1{,}000 + 1{,}000 + 3{,}000)} \times \$15{,}000$

$\$9{,}000 = \frac{3{,}000}{(1{,}000 + 1{,}000 + 3{,}000)} \times \$15{,}000$

[b] $39,000 cost of Personnel is $36,000 (direct cost) + $3,000 (allocated from Maintenance)

$\$7{,}800 = \frac{500}{(500 + 2{,}000)} \times \$39{,}000$

$\$31{,}200 = \frac{2{,}000}{(500 + 2{,}000)} \times \$39{,}000$

Using this method, more costs ($150) are allocated to the Developing Department than by using the direct method.

11-27. (30 min.) Cost Allocations—Reciprocal Method: Warren Ltd.

Set up the equations:

Total service department costs	=	Direct costs of the service department	+	Cost allocated to the service department
S1 (Maintenance)	=	$400,000	+	0.80 S2
S2 (Cafeteria)	=	320,000	+	0.20 S1

Substituting, the first equation into the second yields,

$$S2 = \$320,000 + 0.20 (\$400,000 + 0.80\ S2)$$
$$S2 = \$320,000 + \$80,000 + 0.16\ S2$$
$$0.84\ S2 = \$400,000$$
$$S2 = \$476,190$$

Substituting the value of S2 back into the first equation gives,

$$S1 = \$400,000 + 0.80 (\$476,190)$$
$$S1 = \$780,952$$

Allocations

	Cost Allocation To:			
From:	Maintenance	Cafeteria	Building A	Building B
Service dept. costs.....	$400,000	$320,000	$ 0	$ 0
Maintenance[a]...	(780,952)	156,190	390,476	234,286
Cafeteria[b].....	380,952	(476,190)	47,620	47,618
Total.....	$ 0	$ 0	$438,096	$281,904

[a] $156,190 = 0.2 x $780,952; $390,476 = 0.5 x $780,952; $234,286 = 0.3 x $780,952.

[b] $380,952 = 0.8 x $476,190; $47,620 = 0.1 x $476,190 (rounded up);
$47,618 = 0.1 x $476,190 (rounded down).

11-28. (30 min.) Cost Allocations—Reciprocal Method, Two Service Departments: Postaic Company.

Set up the equations:

Total service department costs	=	Direct costs of the service department	+	Cost allocated to the service department
S1 (Administration)	=	$120,000	+	0.10 S2
S2 (Factory Support)	=	312,500	+	0.40 S1

Substituting, the first equation into the second yields,

$$S2 = \$312,500 + 0.40 (\$120,000 + 0.10\ S2)$$
$$S2 = \$312,500 + \$48,000 + 0.04\ S2$$
$$0.96\ S2 = \$360,500$$
$$S2 = \$375,521$$

Substituting the value of S2 back into the first equation gives,

$$S1 = \$120,000 + 0.10 (\$375,521)$$
$$S1 = \$157,552$$

11-28 (continued)

Allocations

	Cost Allocation To:				
From:	Administration	Factory Support	Fabrication	Assembly	Finishing
Service department costs..	$120,000	$312,500	—	—	—
Administration[a].....	(157,552)	$63,021	$ 47,266	$ 31,510	$ 15,755
Factory Support[b].....	37,552	(375,521)	75,104	56,328	206,537
Total Allocations.....	$0	$0	$ 122,370	$ 87,838	$ 222,292
Direct costs			390,000	67,000	59,500
Total costs.....			$512,370	$ 154,838	$ 281,792

[a] $63,021 = 0.4 x $157,552; $47,266 = 0.3 x $157,552; $63,021 = 0.2 x $157,552; $31,510 = 0.1 x $157,552.

[b] $37,552 = 0.1 x $375,521; $75,104 = 0.2 x $375,521; $56,328 = 0.15 x $375,521; $206,537 = 0.55 x $375,521, subject to some minor rounding differences.

11-29. (35 min.) Cost Allocation—Reciprocal Method: University Printers

Set up the equations:

Total service department costs	=	Direct costs of the service department	+	Cost allocated to the service department
S1 (Maintenance)	=	$15,000	+	(1/6) S2
S2 (Personnel)	=	36,000	+	(1/5) S1

Substituting, the first equation into the second yields,

S2 = $36,000 + 0.20 [$15,000 + (1/6) S2]
S2 = $36,000 + $3,000 + (1/30) S2
(29/30) S2 = $39,000
S2 = $40,345

Substituting the value of S2 back into the first equation gives,

S1 = $15,000 + (1/6) ($40,345)
S1 = $21,724

Allocations

	Cost Allocation To:			
From:	Maintenance	Personnel	Printing	Developing
Service department costs	$15,000	$36,000	—	—
Maintenance[a]	(21,724)	$4,345	$4,345	$ 13,034
Personnel[b]	6,724	(40,345)	6,724	26,897
Total[c]	$0	$0	$11,069	$39,931

[a] $4,345 = 0.2 x $21,724; $4,345 = 0.2 x $21,724; $13,304 = 0.6 x $21,724.

[b] $6,724 = (1/6) x $40,345; $6,724 = (1/6) x $40,345; $26,897 = (2/3) x $40,345.

[c] Slight discrepancy due to rounding.

11-30. (15 min.) Evaluate Cost Allocation Methods: University Printers

a. The answer to this question depends on the cost and benefits of each method. The reciprocal method takes into account the fact that each service department uses the services of the other. While the difference in costs is small, there is a gain of increasing cross-department cost monitoring.

b. The value of any particular method depends on how the numbers will be used. If the allocations are used only to compute inventory values and cost of goods sold in external financial statements, then it usually makes sense to use the easiest method. If the numbers are to be used for managerial decision making, then the increased precision of the more complex methods might justify the additional cost.

11-31. (15 min.) Reciprocal Cost Allocation – Outsourcing a Service Department: Warren Ltd.

To determine the avoidable cost, first determine the variable cost (including the variable cost of reciprocal services for the maintenance department). This is done by using the reciprocal method using only variable costs.

Set up the equations:

Total service department costs	=	Direct costs of the service department	+	Cost allocated to the service department
S1 (Maintenance)	=	$145,000	+	0.80 S2
S2 (Cafeteria)	=	160,000	+	0.20 S1

Substituting, the first equation into the second yields,

$$\begin{aligned} S2 &= \$160,000 + 0.20\ (\$145,000 + 0.80\ S2) \\ S2 &= \$160,000 + \$29,000 + 0.16\ S2 \\ 0.84\ S2 &= \$189,000 \\ S2 &= \$225,000 \end{aligned}$$

Substituting the value of S2 back into the first equation gives,

$$\begin{aligned} S1 &= \$145,000 + 0.80\ (\$225,000) \\ S1 &= \$325,000 \end{aligned}$$

The avoidable costs from outsourcing Maintenance is $415,000 (= $90,000 avoidable fixed costs + $325,000 avoidable variable costs).

11-32. (15 min.) Reciprocal Cost Allocation – Outsourcing a Service Department: University Printers.

To determine the avoidable cost, first determine the variable cost (including the variable cost of reciprocal services for the maintenance department). This is done by using the reciprocal method using only variable costs.

Set up the equations:

Total service department costs	=	Direct costs of the service department	+	Cost allocated to the service department
S1 (Maintenance)	=	$8,750	+	(1/6) S2
S2 (Personnel)	=	20,000	+	(1/5) S1

Substituting, the first equation into the second yields,

S2 = $20,000 + (1/5) [$8,750 + (1/6) S2]
S2 = $20,000 + $1,750 + (1/30) S2
(29/30) S2 = $21,750
S2 = $22,500

Substituting the value of S2 back into the first equation gives,

S1 = $8,750 + (1/6) ($22,500)
S1 = $12,500

The avoidable costs from outsourcing Personnel is $28,500 (= $6,000 avoidable fixed costs + $22,500 avoidable variable costs).

11-33. (15 min.) Net Realizable Value Method.

Total joint costs are $1,350,000 (based on the $450,000 materials plus $900,000 conversion). These costs are allocated as follows:

To Output C-30:

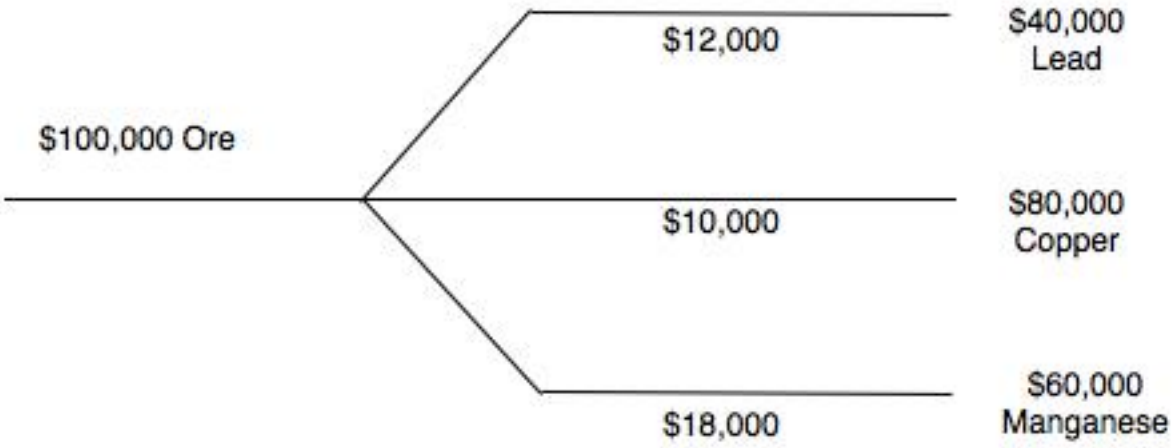
$$\frac{\$2,000,000}{(\$2,000,000 + \$500,000)} \times \$1,350,000 = \$1,080,000$$

To Output C-40:

$$\frac{\$500,000}{(\$2,000,000 + \$500,000)} \times \$1,350,000 = \$270,000$$

11-34. (20 min.) Estimated Net Realizable Value Method: Blasto, Inc..

Although not required, the process may be diagrammed as follows:



The diagram can be used to help organize the solution, which follows:

	Lead	Copper	Manganese	Total
Selling price	$40,000	$80,000	$60,000	$180,000
Additional processing	(12,000)	(10,000)	(18,000)	(40,000)
Approximate sales value at split-off	$28,000	$70,000	$42,000	$140,000
% of total sales values at split-off[a]	20%	50%	30%	100%
Cost Allocation:				
20% x $100,000	$20,000			
50% x $100,000		$50,000		
30% x $100,000			$30,000	

Check:

Total allocated = $100,000 = $20,000 + $50,000 + $30,000

[a] $20\% = \frac{\$28,000}{\$140,000}$; $50\% = \frac{\$70,000}{\$140,000}$; $30\% = \frac{\$42,000}{\$140,000}$

11-35. (20 min.) Net Realizable Value Method To Solve For Unknowns: GG Products, Inc.

Since the sales value of each product at the split-off point is available, the appropriate basis for allocation using the net realizable value method is $78,750 (which is $63,000 + $15,750).

Let TC equal the unknown total costs. The allocation of $36,000 to tips must have been the result of the allocation equation:

$$\frac{\$63,000}{\$63,000 + \$15,750} \times TC = \$36,000$$

So, solving for TC, we obtain:

$$\frac{\$63,000}{\$63,000 + \$15,750} \times TC = \$36,000$$

$$0.80 \times TC = \$36,000$$

$$TC = \$45,000$$

11-36. (10 min.) Net Realizable Value Method: Alpha Company.

The net realizable value method allocates joint costs in proportion to the net realizable value of the individual products. Given total joint costs of $300,000 and total sales value at split-off of $500,000 ($350,000 product XX-1 + $150,000 product XX-2), the calculation is:

$$\frac{\$350,000}{\$350,000 + \$150,000} \times \$300,000 = \$210,000$$

11-37. (10 min.) Net Realizable Value Method with By-Products: Grand Company.

The net realizable value method allocates joint costs in proportion to the net realizable value of the individual products. Given total joint costs of $280,800 and the total sales value at split-off for main products of $540,000 ($300,000 product Alpha + $240,000 product Beta), the calculation is:

$$\frac{\$240,000}{\$300,000 + \$240,000} \times \$280,800 = \$124,800$$

11-38. (15 min.) Net Realizable Value Method: Douglas Company.

The net realizable value method is a cost allocation method that allocates joint costs in proportion to the net realizable value of the individual products. The calculation is:

	Net Realizable Value at Split-Off ($000)	Allocation	Joint Costs Allocated
W-10.....	$ 210	(210 ÷ 600) x $240,000	$84,000
W-20.....	180	(180 ÷ 600) x 240,000	72,000
W-30.....	120	(120 ÷ 600) x 240,000	48,000
W-40.....	90	(90 ÷ 600) x 240,000	36,000
	$600		$240,000

Note: The costs incurred after split-off are not joint costs and are therefore not included.

11-39. (20 min.) Physical Quantities Method: Kyle Company.

a.

Total units of KA ..... = 56,000 units
Total units produced ..... = 112,000 units
Joint product costs..... = $126,000

Amount allocated from joint costs:

$$\frac{56,000}{112,000} \times \$126,000 = \$63,000$$

Additional processing costs 36,000
Total costs of Product KA $99,000

b.

Net realizable value of KB at split-off..... = $140,000
Total net realizable value at split-off ..... = 400,000
Joint product costs..... = 126,000

Amount allocated from joint costs:

$$\frac{\$140,000}{\$400,000} \times \$126,000 = \$44,100$$

Additional processing costs 28,000
Total costs allocated to KB $72,100

11-40. (20 min.) Physical Quantities Method With By-Product: Trans-Pacific Lumber

The net realizable value of the sawdust ($10,000) is deducted from the total processing costs ($270,000) to obtain the net processing costs to be allocated ($260,000).

The allocation computations are:

To Grade-A Lumber:

$$\frac{25{,}500 \text{ units}}{25{,}500 \text{ units} + 59{,}500 \text{ units}} \times \$260{,}000 = \$78{,}000$$

and to Grade-B Lumber:

$$\frac{59{,}500 \text{ units}}{25{,}500 \text{ units} + 59{,}500 \text{ units}} \times \$260{,}000 = \$182{,}000$$

Solutions to Problems

11-41. (50 min.) Step Method With Three Service Departments: Model, Inc..

a. To facilitate solution, reduce the different allocation bases to proportions used by departments other than the same department.

	Proportion Used By				
	Administration	Accounting	Maintenance	Molding	Painting
Building Area.....	—[a]	.06[b]	.04[b]	.72	.18
Employees	.09[c]	—[a]	.06[c]	.35	.50
Equipment Value...	.01[d]	.20[d]	—[a]	.52[d]	.27

[a] Self-usage is ignored

[b] Basis is 500,000 square feet, which ignores Administration: .06 = 30,000 ÷ 500,000; .04 = 20,000 ÷ 500,000; etc.

[c] Basis is 200 employees, which ignores Accounting: .09 = 18 ÷ 200; .06 = 12 ÷ 200; etc.

[d] Basis is $600, which ignores Maintenance: .01 = $6 ÷ $600; .20 = $120 ÷ $600; .52 = $312 ÷ $600; etc.

11-41. (continued)

Model, Inc.
Step Method

	To				
	Maintenance	Accounting	Administration	Molding	Painting
Direct Costs	$198,000	$375,000	$270,000	$687,500	$485,000
FROM					
Maintenance[a].....	(198,000)	39,600	1,980	102,960	53,460
Accounting[b].....		(414,600)	39,696	154,372	220,532
Administration[c]	_____	_____	(311,676)	249,341	62,335
Totals.....	–0–	–0–	–0–	$1,194,173	$821,327

a

$$\$39,600 = \frac{.20}{(.01 + .20 + .52 + .27)} \times \$198,000;$$

$$\$1,980 = \frac{.01}{(.01 + .20 + .52 + .27)} \times \$198,000, \text{ etc.}$$

b

$$\$39,696 = \frac{.09}{(.09 + .35 + .50)} \times \$414,600;$$

$$\$154,372 = \frac{.35}{(.09 + .35 + .50)} \times \$414,600, \text{ etc.}$$

c

$$\$249,341 = \frac{.72}{(.72 + .18)} \times \$311,676;$$

$$\$62,335 = \frac{.18}{(.72 + .18)} \times \$311,676$$

$1,194,173 + 821,327 = $2,015,500 which is the total of the direct costs for all service and producing departments.

11-41. (continued)

b.

	Molding	Painting
Direct materials	$237,500	$210,000
Direct labor	337,500	200,000
Overhead (direct)	112,500	75,000
Overhead (allocated)	506,673	336,327
Totals	$1,194,173	$821,327

Unit cost:

Molding:	$1,194,173 ÷ 100,000 units =	$11.94
Painting:	$821,327 ÷ 100,000 units =	8.21
Total		$20.15

c. Unit cost of allocated service department costs:

Molding: $506,673 ÷ 100,000 units = $5.07

Painting: $336,327 ÷ 100,000 units = $3.36

Molding did not meet management's standard of keeping service department costs below $3.50, but Painting did meet the standard.

11-42. (40 min.) Comparison of Allocation Methods: GB Service Corp.

a. Direct Method:

	Administration	Accounting	East	West
Department costs.....	$60,000	$24,000	$156,000	$600,000
Administration allocation[a]	(60,000)	NA	12,000	48,000
Accounting allocation[b]	NA	(24,000)	4,800	19,200
Total costs allocated	–0–	–0–	$172,800	$667,200

[a] $\$ 12,000 = \frac{15}{(15 + 60)} \times \$60,000$

$\$48,000 = \frac{60}{(15 + 60)} \times \$60,000$

[b] $\$ 4,800 = \frac{10,000}{(10,000 + 40,000)} \times \$24,000$

$\$19,200 = \frac{40,000}{(10,000 + 40,000)} \times \$24,000$

b. Step Method—Administration First:

			To	
From	Admin	Accounting	East	West
Department costs	$60,000	$24,000	$156,000	$600,000
Administration allocation[a].....	(60,000)	15,000	9,000	36,000
Accounting allocation[b]		(39,000)	7,800	31,200
Total Costs	–0–	–0–	$172,800	$667,200

[a] $\$ 15,000 = \frac{25}{(25 + 15 + 60)} \times \$60,000$

$\$ 9,000 = \frac{15}{(25 + 15 + 60)} \times \$60,000$

$\$ 36,000 = \frac{60}{(25 + 15 + 60)} \times \$60,000$

[b] $39,000 = $24,000 direct costs + $15,000 from Administration.

$$\$\ 7{,}800 = \frac{10{,}000}{(10{,}000 + 40{,}000)} \times \$39{,}000$$

$$\$31{,}200 = \frac{40{,}000}{(10{,}000 + 40{,}000)} \times \$39{,}000$$

11-42. (continued)

c. Reciprocal Method:

Set up the equations:

Total service department costs	=	Direct costs of the service department	+	Cost Allocated to the Service Department
S1 (Administration)	=	$60,000	+	0.50 S2
S2 (Accounting)	=	24,000	+	0.25 S1

Substituting, the first equation into the second yields,

S2 = $24,000 + 0.25 ($60,000 + 0.50 S2)
S2 = $24,000 + $15,000 + 0.125 S2
0.875 S2 = $39,000
S2 = $44,571

Substituting the value of S2 back into the first equation gives,

S1 = $60,000 + 0.50 ($44,571)
S1 = $82,286

Allocations:

	Administration	Accounting	East	West
Costs	$60,000	$24,000	$156,000	$600,000
Administration[a]	(82,286)	20,571	12,343	49,372
Accounting[b]	22,286	(44,571)	4,457	17,828
Total	$ 0	$ 0	$172,800	$667,200

[a] $20,571 = 0.25 x $82,286; $12,343 = 0.15 x $82,286; $49,372 = 0.60 x $82,286.

[b] $22,286 = 0.50 x $44,571; $4,457 = 0.10 x $44,571; $17,828 = 0.40 x $44,571.

d.

Regardless of the allocation method used, the final allocations are the same. The reason is that both operating departments (East and West) use both service departments in the same proportion. No matter how the service department costs are passed to one another, eventually they are allocated to East and West based on the proportion of 1:4 (either 10,000 transactions to 40,000 transactions or 15 employees to 60 employees).

11-43. (40 min.) Solve For Unknowns: Pat's Print Shop.

a. Since the direct method is used, Operations Support's (S2's) costs are allocated only to P1 and P2, not to S1.

To find the cost of S2's services:

$$\$18{,}000 \text{ from S2 to P2} = \frac{.3}{.5 + .3} \times (S2)$$

$$\$18{,}000 = .375 \times (S2)$$

$$S2 = \frac{\$18{,}000}{.375} = \$48{,}000$$

To find the cost of S1's services:

S1 = Total – S2
S1 = $80,000 – $48,000
S1 = $32,000

Since $32,000 from S1 is allocated to P1, nothing is allocated from S1 to P2.

Total allocated to P2 = $18,000 (= $18,000 + 0).

b.

$$\text{Amount allocated from S2 to P1} = \$30{,}000 = \left(\frac{.5}{.5 + .3} \times \$48{,}000\right)$$

From	To P1	To P2
S1	$32,000	–0–
S2	$30,000	$18,000

c. All of S1's costs were allocated to P1 and none were allocated to P2.

11-44. (60 min.) Cost Allocation—Step Method With Analysis And Decision Making: Steamco Corporation.

a. The company considered only the direct costs of the electric generating plant. It did not include the costs of the steam plant or other indirect costs.

11-44. (continued)

b. Let: S1 = Steam generation

S2 = Electric generating—fixed

S3 = Electric generating—variable

S4 = Equipment maintenance

P1 = Alpha

P2 = Beta

Allocation:

		To				
	Amount to	S4	S2	S3	P1	P2
From:	be allocated	$144	$90	$240	$1,800.00	$1,320.00
Steam generation (S1)[a]	$ 210			84	21.00	105.00
Equipment maintenance (S4)[b]	144	(144)	18	9	90.00	27.00
Electric generating—fixed (S2)[c]	108		(108)	0	40.50	67.50
Electric generating—variable (S3)[d]	333			(333)	215.47	117.53
					$2,166.97	$1,637.03

[a]S1 allocation: $84 = $210 x .40; $21 = $210 x .10; $105 = $210 x .50

[b] S4 allocation: $18 = $\frac{.10}{.10 + .05 + .50 + .15}$ x $144; $9 = $\frac{.05}{.80}$ x $144; etc.

[c]S2 allocation:

$40.5 = $\frac{.30}{(.30 + .50)}$ x $108; 67.50 = $\frac{.50}{(.30 + .50)}$ x $108

[d]S3 allocation:

$$\$215.47 = \frac{.55}{(.55 + .30)} \times \$333; \quad \$117.53 = \frac{.30}{(.55 + .30)} \times \$333$$

Costs allocated from the electric department S2 + S3 = $108 + $333 = $441.

If electricity generation *causes* the costs allocated to it, then the company would compare $441,000 internal cost to $480,000 from the outside utility.

11-44. (continued)

c. If the company could realize $174,000 from the sale of the steam, then the relevant costs would be:

Forgone steam sales	$174,000[a]
Equipment maintenance	27,000[b]
Direct costs	330,000
	$531,000

which is greater than the proposed $480,000 electric company rates. Of course, management might want to consider other factors when making this decision.

[a]The $174,000 from the sale of steam is an opportunity cost. If Steamco produces its own electricity, it *loses* $174,000 in potential sales of steam.

[b] $27,000 = $18,000 + $9,000 allocated from equipment maintenance.

11-45. (30 min.) (Appendix) Cost Allocations—Reciprocal Method (Computer Required): Steamco.

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Panel A: Basic Data**											
2												
3	**Service Department Usage Matrix (S)**											
4	**(Percentage Use)**											
5	**(Positive Numbers: Provide Service - Negative Numbers: Use Service)**											
6		From Department:										
7		S1	S2	S3	S4	Alpha	Beta					
8	To Department:											
9	S1	100.0%	-10.0%	-10.0%	-20.0%	0.0%	0.0%					
10	S2	0.0%	100.0%	0.0%	-10.0%	0.0%	0.0%					
11	S3	-40.0%	0.0%	100.0%	-5.0%	0.0%	0.0%					
12	S4	0.0%	-10.0%	-5.0%	100.0%	0.0%	0.0%					
13	Alpha	-10.0%	-30.0%	-55.0%	-50.0%	100.0%	0.0%					
14	Beta	-50.0%	-50.0%	-30.0%	-15.0%	0.0%	100.0%					
15	Total	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%					
16												
17	**Panel B: Department Costs After Reciprocal Service Costs**							**Direct**				
18								**Department**				
19	**Inverse of Service Matrix (S-Inv)**							**Cost**				
20		S1	S2	S3	S4	Alpha	Beta					
21	S1	104.64%	12.74%	11.60%	22.78%	0.00%	0.00%	$210		$291.87		
22	S2	0.21%	101.04%	0.53%	10.17%	0.00%	0.00%	$90		$107.30		
23	S3	41.96%	5.62%	104.91%	14.20%	0.00%	0.00%	$240	=	$365.40		
24	S4	2.12%	10.38%	5.30%	101.73%	0.00%	0.00%	$144		$173.00		
25	Alpha	34.67%	39.87%	61.67%	64.00%	100.00%	0.00%	$1,800		$2,148.85	<=====	**Reciprocal**
26	Beta	65.33%	60.13%	38.33%	36.00%	0.00%	100.00%	$1,320		$1,655.15	<=====	**Allocations**
27							Total	$3,804				

The total costs of the two producing departments include their direct costs. The allocated costs, therefore, are:

Alpha.....	($2,148.85 – $1,800.00)	=	$348.85
Beta	($1,655.15 – $1,320)	=	335.15
Total service department costs			$684.00

11-46. (30 min.) Cost Allocations— Step Method, Reciprocal Method: Manzano Bank.

a. The key to this problem is to recognize that Administration provides no service to either of the other two service departments and that Processing only provides services to Administration and not to Maintenance. Therefore, there are no reciprocal services between Administration and the other service departments or between Processing and Administration.

The cost equations can be written as follows:

Maintenance = $330,000 (Given);

Processing = $120,000 + 10% x Maintenance;

Administration = $750,000 + 20% x Maintenance + 50% x Processing.

Allocating costs in the order specified:

		Allocated to:			
	Costs	Processing	Adminstration	Branches	Electronic
Maintenance	$330,000	$33,000	$66,000	$66,000	$165,000
		(10%)	(20%)	(20%)	(50%)
Processing	153,000	–	76,500	15,300	61,200
	(= $120,000 + $33,000)		(50%)	(10%)	(40%)
Administration	$892,500	–	–	535,500	357,000
	(= $750,000 + $66,000 + $76,500)			(60%)	(40%)
Total				$616,800	$583,200

b. This is exactly the same as you would get using the step method because of the pattern of usage.

11-47. (30 min.) Cost Allocations— Step Method, Reciprocal Method: Farmington Components.

The key to this problem is to write out the equations expressing the usage:

Administration = $950,000 + 0.5 x Engineering + 0.2 x Maintenance

Engineering = $200,000 + 0.2 x Administration

Maintenance = $250,000 + 0.10 x Administration

Substituting the equations for Engineering and Maintenance into the equation for Administration yields:

Administration = $950,000 + $100,000 + 0.1 x Administration + $50,000
+ 0.02 x Administration

Solving, Administration = $1,250,000; Engineering = $450,000; and
Maintenance = $375,000

		Allocated to:	
Costs		Fabrication	Assembly
Engineering	$450,000	$45,000	$180,000
		(10%)	(40%)
Administration	1,250,000	625,000	250,000
		(50%)	(20%)
Maintenance	$375,000	112,500	187,500
		(30%)	(50%)
Total		$782,500	$617,500

11-48. (35 min.) Allocate Service Department Costs: Not-A-Mega Bank

a. $140,000

$$\$140{,}000 = \frac{140}{(140 + 100)} \times \$240{,}000$$

b. $70,000

$$\$70{,}000 = \frac{218{,}750}{(281{,}250 + 218{,}750)} \times \$160{,}000$$

c. $5,856

$$\$5{,}856 = \frac{9{,}600}{(3{,}500 + 9{,}600 + 176{,}000 + 144{,}000)} \times \$203{,}200$$

d. $0.

There is no allocation of costs back to the department after costs have been allocated from it. Facilities costs have already been allocated from it to other departments.

11-49. (45 min.) Allocate Service Department Costs—Ethical Issues: FSP.

a. Direct Method:

	Member Department	Commercial Department	Total
Accounting	$8,000[a]	$8,000[a]	$16,000
Computer Services	12,320[b]	49,280[c]	61,600
Total.....	$20,320	$57,280	$77,600

[a] $\$8,000 = \frac{.40}{(.40 + .40)} \times \$16,000$

[b] $\$12,320 = \frac{.10}{(.10 + .40)} \times \$61,600$

[c] $\$49,280 = \frac{.40}{(.10 + .40)} \times \$61,600$

b. This is clearly unethical and likely fraudulent.

c. The answer to this question depends, at least in part, on the reason for the change. If there is evidence that the support from accounting is related to the wages of the employees, for example, if the accounting staff has more paperwork because of the higher wages, then this request is not unethical. If it is done simply to shift cost to the one department, it seems to be unethical.

d. Step Method:

	Computer Services	Accounting	Member Department	Commercial Department
Before allocation	$61,600	$16,000	$ –0–	$ –0–
Computer Services	(61,600)	30,800[a]	$6,160[b]	$24,640[c]
Accounting		(46,800)	23,400[d]	23,400[d]
Total	$ –0–	$ –0–	$29,560	$48,040

[a] $30,800 = $\frac{.50}{(.50 + .10 + .40)}$ x $61,600

[b] $6,160 = $\frac{.10}{(.50 + .10 + .40)}$ x $61,600

[c] $24,640 = $\frac{.40}{(.50 + .10 + .40)}$ x $61,600

[d] $23,400 = $\frac{.40}{(.40 + .40)}$ x ($16,000 + $30,800)

11-49. (continued)

e. Reciprocal Method:

Set up the equations:

Total service department costs	=	Direct costs of the service department	+	Cost Allocated to the Service Department
S1 (Accounting)	=	$16,000	+	0.50 S2
S2 (Computer Services)	=	61,600	+	0.20 S1

Substituting, the first equation into the second yields,

$$S2 = 61,600 + 0.20 ($16,000 + 0.50 S2)$$
$$S2 = 61,600 + 3,200 + 0.10 S2$$
$$0.90 S2 = $64,800$$
$$S2 = $72,000$$

Substituting the value of S2 back into the first equation gives,

S1 = $16,000 + 0.50 ($72,000)
S1 = $52,000

Allocations

From:	Accounting	Computer Service	Member	Commercial
Costs	$16,000	$61,600		
Accounting[a]	(52,000)	$10,400	20,800	20,800
Computer Service[b]	36,000	(72,000)	7,200	28,800
Total	$0	$0	$28,000	$49,600

[a] $10,400 = 0.2 x $52,000; $20,800 = 0.4 x $52,000; $20,800 = 0.4 x $52,000.

[b] $36,000 = 0.50 x $72,000; $7,200 = 0.10 x $72,000; $28,800 = 0.40 x $72,000.

f. This appears to be unethical. The controller could argue correctly that the reciprocal method better assigns costs because of the heavy use of computer services by accounting. What raises ethical issues would be using the result of the allocation to determine the method of allocation.

11-50. (45 min.) Reciprocal Cost Allocation – Outsourcing a Service Department: GB Service Corp.

a. To determine the avoidable cost, first determine the variable cost (including the variable cost of reciprocal services for the maintenance department). This is done by using the reciprocal method using only variable costs.

Set up the equations:

Total service department costs	=	Direct costs of the service department	+	Cost Allocated to the Service Department
S1 (Administration)	=	$25,000	+	0.50 S2
S2 (Accounting)	=	6,000	+	0.25 S1

Substituting, the first equation into the second yields,

$$S2 = \$6,000 + 0.25 (\$25,000 + 0.50\ S2)$$
$$S2 = \$6,000 + \$6,250 + 0.125\ S2$$
$$0.875\ S2 = \$12,250$$
$$S2 = \$14,000$$

Substituting the value of S2 back into the first equation gives,

$$S1 = \$25,000 + 0.50 (\$14,000)$$
$$S1 = \$32,000$$

The avoidable costs from outsourcing Administration is $42,000 (= $10,000 avoidable fixed costs + $32,000 avoidable variable costs).

b. The avoidable costs from outsourcing Accounting is $17,000 (= $3,000 avoidable fixed costs + $14,000 avoidable variable costs).

c. The avoidable costs from outsourcing both the Administration and Accounting Departments is $44,000 (= $13,000 avoidable fixed costs in both departments + $31,000 avoidable variable costs in both departments). You cannot add the amounts found in the reciprocal analysis, because there is double counting. For example, in requirement (a) we saved all the variable cost in Administration plus some amount of variable cost in Accounting.

11-51. (45 min.) Reciprocal Cost Allocation – Outsourcing a Service Department: Manzano Bank.

To determine the avoidable cost, first determine the variable cost (including the variable cost of reciprocal services for the maintenance department). This is done by using the reciprocal method using only variable costs. As discussed in the solution to Problem 11-46, this can be done as with the step method, substituing variable costs for total costs. Once the variable costs are determined, we can add the avoidable fixed costs to estimate the total avoidable cost.

The cost equations can be written as follows (using variable costs only):

Maintenance = $180,000 (Given);

Processing = $80,000 + 10% x Maintenance;

Administration = $240,000 + 20% x Maintenance + 50% x Processing.

Allocating costs in the order specified, and ignoring the allocation of costs to the "production" departments:

		Allocated to:	
Costs		Processing	Adminstration
Maintenance	$180,000	$18,000	$36,000
		(10%)	(20%)
Processing	$98,000	–	49,000
	(= $80,000 + $18,000)		(50%)
Administration	$325,000	–	–
	(= $240,000 + $36,000 + $49,000)		

Department	Avoidable Variable Costs	Avoidable Fixed Costs	Total Avoidable Costs
a. Processing	$98,000	$10,000	$108,000
b. Administration	325,000	403,000	728,000
c. Maintenance	180,000	120,000	300,000

11-52. (45 min.) Reciprocal Cost Allocation – Outsourcing a Service Department: Farmington Components.

To determine the avoidable cost, first determine the variable cost (including the variable cost of reciprocal services for the maintenance department). This is done by using the reciprocal method using only variable costs. The key to this problem is to write out the equations expressing the usage:

Administration = $320,000 + 0.50 x Engineering + 0.20 x Maintenance

Engineering = $100,000 + 0.20 x Administration

Maintenance = $130,000 + 0.10 x Administration

Substituting the equations for Engineering and Maintenance into the equation for Administration yields:

Administration = $320,000 + $50,000 + 0.1 x Administration + $26,000
+ 0.02 x Administration

Administration = $320,000 + $50,000 + $26,000
+ 0.1 x Administration + 0.02 x Administration

0.88 x Administration = $396,000

Solving, Administration = $450,000; Engineering = $190,000; and
Maintenance = $175,000

Department	Avoidable Variable Costs	Avoidable Fixed Costs	Total Avoidable Costs
a. Engineering	$190,000	$70,000	$260,000
b. Administration.....	450,000	400,000	850,000
c. Maintenance	175,000	70,000	245,000

11-53. (45 min.) Net Realizable Value of Joint Products: Toledo Chemical Company

a. $150,000

Since there is no further processing for B-1 after split-off, the net realizable value is simply the sales value of *all* units produced.

$$\text{Price per unit} = \frac{\$90{,}000}{45{,}000 \text{ units sold}} = \$2.00$$

Units produced = 75,000 units (= 45,000 sold + 30,000 in ending inventory).

Total net realizable value = $150,000 (= 75,000 units x $2.00)

b. $420,000.

The joint costs to be allocated are all costs up to split-off, that is, all costs in Department 1.

Cost of A-123.....	$288,000
Direct labor	72,000
Overhead.....	60,000
Total.....	$420,000

11-53. (continued)

c. $282,000.

Net realizable value of B-1.....	$150,000[a]
Net realizable value of B-2.....	90,000[b]
Net realizable value of B-3.....	210,000[c]
Total	$450,000

[a] From requirement a.

[b] $288,000 – $135,000 – $63,000 = $90,000

[c] $\frac{\$425,250}{135,000 \text{ units}} \times 180,000 \text{ units} - \$195,000 - \$162,000 = \$210,000$

Allocation of joint costs to B-2:

$\frac{\$90,000}{\$450,000} \times \$420,000 = \$ 84,000$

Additional processing costs:

Direct labor	135,000
Overhead	63,000
Total cost of B-2	$282,000

d. $56,000.

Using information from c above, the allocation to B-1 is:

$\frac{\$150,000}{\$450,000} \times \$420,000 = \$140,000$

Cost per unit = $140,000 ÷ 75,000 units produced = $1.867/unit

Cost of ending inventory:

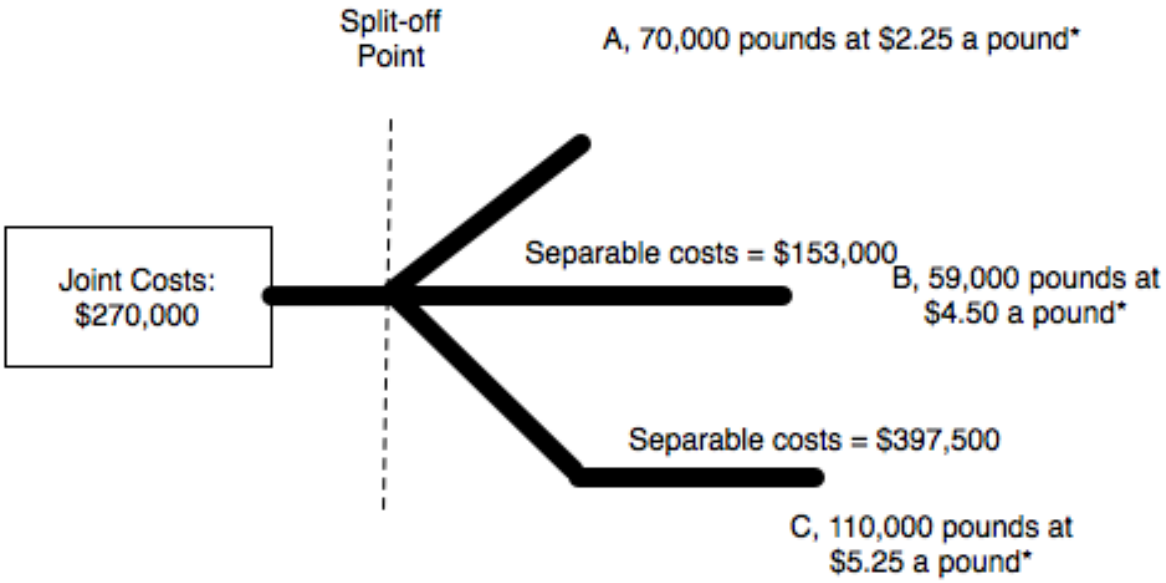
30,000 units x $1.867 = $56,000 (adjusted for rounding)

11-54. (40 min.) Net Realizable Value and Effects Of Processing Further: Fletcher Fabrication, Inc.

a.

	Departments		
Production Costs	X	Y	Z
Raw materials	$168,000	—	—
Direct labor	72,000	$121,350	$ 287,625
Manufacturing overhead	30,000	31,650	109,875
Total	$270,000	$153,000	$397,500

A diagram of the problem follows:



*$2.25 = $45,000 ÷ 20,000 lbs; $4.50 = $265,500 ÷ 59,000 lbs;

$5.25 = $367,500 ÷ 70,000 lbs.

11-54. (continued)

	Product A	Product B	Product C	Total
1. Selling price per pound:				
X: $45,000 ÷ 20,000	$2.25			
Z: $367,500 ÷ 70,000			$5.25	
Multiply by pounds produced:				
A: 20,000 + 50,000	x 70,000			
C: 70,000 + 40,000	_____	_____	x 110,000	
Gross sales values	$157,500	$265,500[a]	$577,500[b]	
Less costs of separate processing:				
A: —	—	—	—	
B: $121,350 + $31,650	—	153,000	—	
C: $287,625 + $109,875	—	—	397,500	
Estimated net realizable values at split-off point	$157,500	$ 112,500	$180,000	$450,000
Percentage of total	35%	25%	40%	100%

[a] Given

[b] Or: $367,500 x (110,000 ÷ 70,000) = $577,500

2. Total joint costs: $168,000 + $72,000 + $30,000 = $270,000

   Allocation:

A: 35% x $270,000 =	$94,500
B: 25% x $270,000 =	67,500
C: 40% x $270,000 =	108,000

11-54. (continued)

3. and 4.	Total Costs	Cost of Goods Sold	Ending Inventory
Product A:			
Joint costs allocated	$ 94,500		
Sold: (20,000 ÷ 70,000) x $94,500		$ 27,000	
Inventory			$ 67,500
Product B:			
Joint costs allocated	$ 67,500		
Separate processing costs	153,000		
Total, all sold	$220,500	220,500	0
Product C:			
Joint costs allocated	$ 108,000		
Separate processing costs	397,500		
Total costs of Z	$505,500		
Sold: (70,000 ÷ 110,000) x $505,500		321,682	
Inventory			183,818
Totals	$820,500	$569,182	$251,318
Proof of total:			
Raw material cost Dept. X	$168,000		
Direct labor cost—X	72,000		
Direct labor cost—Y	121,350		
Direct labor cost—Z	287,625		
Manufacturing overhead—X	30,000		
Manufacturing overhead—Y	31,650		
Manufacturing overhead—Z	109,875		
Total costs accounted for	$820,500		

b. Incremental revenue of further processing
A: ($12.90 – $2.25 forgone) x 70,000 ..... $745,500
Incremental costs of further processing
B: $6.00 x 70,000 420,000
Incremental income from further processing A .. $325,500

c. The memo should recommend that Fletcher process product A further. By doing so, profit will increase $325,500.

11-55. (35 min.) Find Missing Data—Net Realizable Value: Athens, Inc.

Athens must be using the net realizable value method because the ratio of argon's joint costs to the total does not equal the ratio of argon's physical units to the total.

a. Allocate joint costs to zeon:

($30,000 zeon net realizable value ÷ $200,000) x $120,000 joint costs = $18,000 (answer to a)

b. Joint costs allocated to xon:

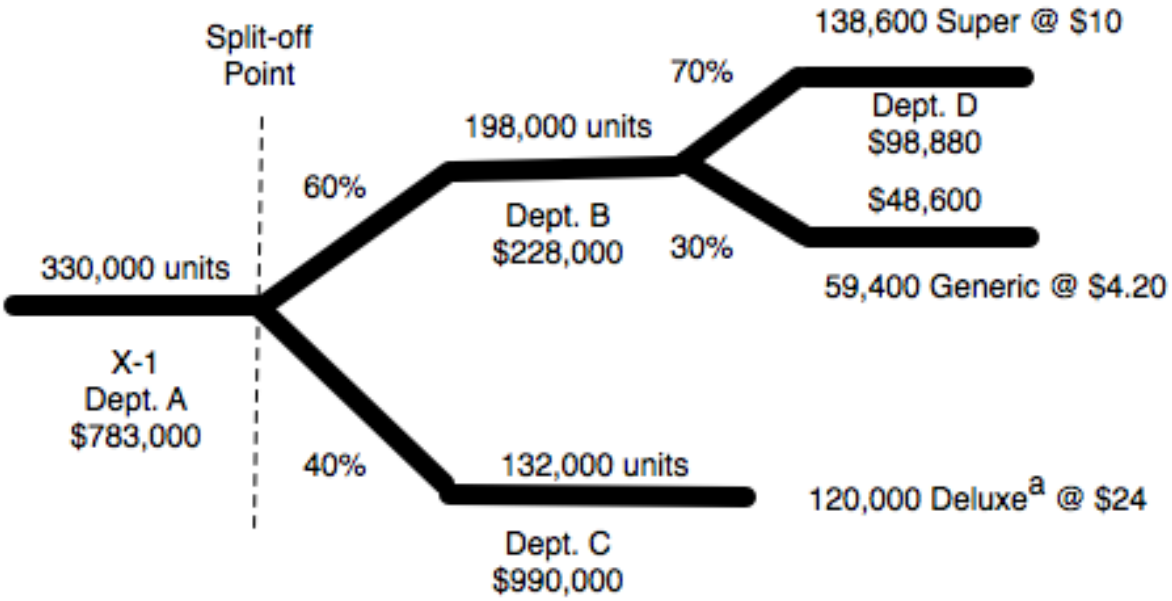
$120,000 total – $60,000 to argon – $18,000 to zeon = $42,000 (answer to b)

c and d.The ratio of sales value at split-off for each product to total sales value at split-off equals the joint cost ratio:

Argon	($60,000 ÷ $120,000) x $200,000	=	$100,000	(answer to c)
Xon:	($42,000 ÷ $120,000) x $200,000	=	$70,000	(answer to d)

11-56. (50 min.) Joint Costing In A Process Costing Context—Estimated Net Realizable Value Method: West Coast Designs.

It is helpful to diagram the flow of units before attempting to solve the problem.



[a]120,000 good output = 132,000 ÷ 110%

The next step is to determine the net realizable values of Super and Deluxe at the first split-off.

	Super	Deluxe
Sales value after completion	$1,386,000[a]	$2,880,000[b]
Separate processing costs:		
Department B	$ (228,000)	
Department C		(990,000)
Department D	(98,880)	
Sales revenue from Generic	249,480[c]	
Additional processing cost for Generic	(48,600)	
Approximate net realizable values	$1,260,000	$1,890,000

[a] (= 138,600 @ $10)

[b] (= 120,000 @ $24)

[c] (= 59,400 @ $4.20)

11-56. (continued)

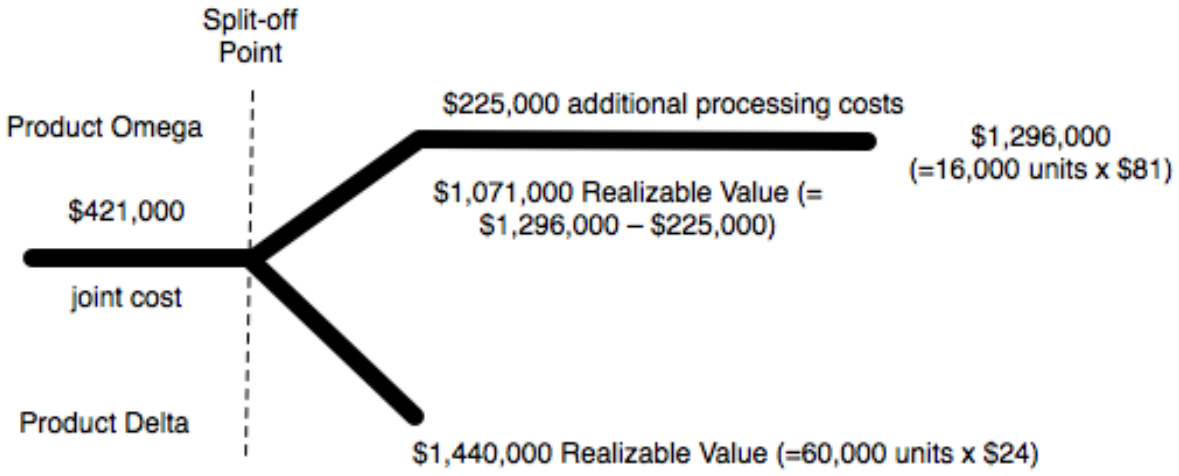
Cost allocation:

$$\text{To Super: } \frac{\$1,260,000}{\$1,260,000 + \$1,890,000} \times \$783,000 = \$313,200$$

$$\text{To Deluxe: } \frac{\$1,890,000}{\$1,260,000 + \$1,890,000} \times \$783,000 = \$469,800$$

11-57. (35 min.) Find Maximum Input Price—Estimated Net Realizable Value Method: Ticon Corporation.

a. A diagram of the operation appears as follows:



The total allowable materials costs would then be:

Sales value of Omega at split-off	$1,071,000
Sales value of Delta at split-off	1,440,000
Joint conversion costs	(421,000)
Balance (maximum materials cost)	$2,090,000

Maximum materials price per unit = $27.50 (= $2,090,000 ÷ 76,000 units).

b. Given the current product mix (60,000 units of product delta and 16,000 units of product omega), Ticon should pay no more than $27.50 per unit of material. If the materials price exceeds this amount, the company will incur an operating loss. See calculations in (a) for further detail.

11-58. (30 min.) Effect Of By-Product versus Joint Cost Accounting: Black Corporation.

a. (1) Accounted for as a joint product.

Allocation:

Xy-1:	60%	x	$365,500	=	$219,300
Xy-2:	30%	x	$365,500	=	$109,650
Xy-3:	10%	x	$365,500	=	$ 36,550

(2) Allocated for as a by-product.

Allocation:

Xy-1:	60% ÷ (60% + 30%)	x	$327,900[a]	=	$218,600
Xy-2:	30% ÷ (60% + 30%)	x	$327,900[a]	=	$109,300
Xy-3:	$37,600, the value of Xy-3 is assigned to Xy-3.				

[a] $327,900 = $365,500 – $37,600 net realizable value of Xy-3.

b. The net realizable value of the by-product (Xy-3) reduces the joint costs of the other two products. Thus, an amount of joint cost equal to the net realizable value of Xy-3 is essentially allocated to the by-product; there is no need to allocate additional joint costs to it.

11-59. (30 min.) Joint Cost Allocation and Product Profitability: Western Woods, Inc.

Total cost = $12,000 + $5,120 = $17,120

a. Allocation on the basis of units of output

Grade A:

$$\frac{4,000}{4,000 + 12,000} \times \$17,120 = \$4,280$$

Grade B:

$$\frac{12,000}{4,000 + 12,000} \times \$17,120 = 12,840$$

$17,120

b. Allocation on the basis of market value

Grade A:

$$\frac{\$28,000}{\$28,000 + \$4,000} \times \$17,120 = \$14,980$$

Grade B:

$$\frac{\$4,000}{\$28,000 + \$4,000} \times \$17,120 = 2,140$$

$17,120

c. It is not possible to determine which product is more profitable. One cannot be produced without the other—hence only the profitability of the *total* output is relevant. Use of the physical quantities measured in Part (a) would suggest that there is a loss on Grade-B lumber. This loss would be calculated as:

Revenue from Grade-B Lumber	$ 4,000
Allocated cost of logs	(12,840)
Loss on Grade-B lumber	$(8,840)

However, if Grade-B lumber were not sold, the $4,000 revenue would be lost but total costs would be unchanged. Hence, net income would fall if this “losing” product were discontinued. This illustrates the potentially misleading effects of cost allocations.

Solution to Integrative Case

11-60. (60 min.) Effect of Cost Allocation on Pricing and Make versus Buy Decisions: Ag-Coop

a. Output:

	Output Mix	Kwh per lb.	Kwh per100 lbs. Input
Greenup.....	50%	32	1,600
Maintane.....	30	20	600
Winterizer	20	40	800
			3,000

Maximum processing: = 750,000 kwh ÷ 3,000 kwh per 100 lbs.
= 25,000 lbs. of input

Fixed cost allocation	$81,250 ÷ 25,000 =	$3.25	per lb.
Feedstock cost		1.50	
Joint costs.....		$4.75	per lb.

Allocated cost per lb. = $4.75 for Greenup, Maintane, and Winterizer.

11-60. (continued)

b. Total joint cost incurred in processing 25,000 lbs. of input =
$81,250 + (25,000 x $1.50) = $118,750

Quantities of each product produced:

Greenup.....	25,000	x .5 =	12,500
Maintane.....	25,000	x .3 =	7,500
Winterizer	25,000	x .2 =	5,000
			25,000

	Sales Price per lb.	Selling Cost/lb. (20% of Sales Price)	Net Realizable Value per lb.	Number of Lbs.	Total NRV
Greenup.....	$10.50	$2.10	$8.40	12,500	$105,000
Maintane....	9.00	1.80	7.20	7,500	54,000
Winterizer ..	10.40	2.08	8.32	5,000	41,600
					$200,600

Allocated cost per lb. of Greenup

= $118,750 x ($105,000 ÷ $200,600) ÷ 12,500 lbs.

= $4.97

Allocated cost per lb. of Maintane

= $118,750 x ($54,000 ÷ $200,600) ÷ 7,500 lbs.

= $4.26

Allocated cost pound lb. of Winterizer

= $118,750 x ($41,600 ÷ $200,600) ÷ 5,000 lbs.

= $4.93

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11-60. (continued)

c. The profit under current production schedule A is:

Total net realizable value	=	$200,600 (from *b* above)
Less joint costs incurred		118,750
		$ 81,850

Outputs under alternative production schedule B:

Product	Output Mix	Unit kwh Usage	Usage per100 Lbs. of Input
Greenup	60%	32	1,920
Maintane	10	20	200
Winterizer	30	40	1,200
			3,320

$$\text{Pounds of input processed} = \frac{750{,}000 \text{ kwh}}{3{,}320 \text{ kwh per hundred pounds}} = 22{,}590 \text{ pounds}$$

Amount of Greenup produced	=	22,590 x	.6	=	13,554
Amount of Maintane produced	=	22,590 x	.1	=	2,259
Amount of Winterizer produced	=	22,590 x	.3	=	6,777
					22,590

The margin under alternate production schedule B is:

($8.40 x 13,554) + ($7.20 x 2,259) + ($8.32 x 6,777) – ($1.50 x 22,590) – $81,250

= $113,853.60 + $16,264.80 + $56,384.64 – $33,885 – $81,250 = $71,368.04

Therefore, current production schedule A yields a higher operating profit of $81,850 versus $71,368.04 for schedule B.

d. The decision would not be different, even if joint costs are allocated based on the net realizable value method. Given the production schedule, the realizable values and the joint costs are the same for either allocation method. Therefore, the better production schedule will not depend on the choice of the allocation method.

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